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Ohio & Auxiliary & Society.

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PROCEEDINGS

OF THE

OHIO AUXILIARY SOCIETY,

OF THE

INTERNATIONAL INSTITUTE,

FOR

PRESERVING & PERFECTING WEIGHTS
AND MEASURES. —

ORGANIZED, DECEMBER 2d, 1879.

Part 1—December 1879 to July 1880.

CLEVELAND, O :
PUBLISHED BY THE SOCIETY,

TO THE READER.

A Society called the INTERNATIONAL INSTITUTE, was organized in Boston, Mass. on the 8th of December, 1879, for the purpose of "Preserving and Perfecting" our present units of weights and measures, and opposing the introduction into this country of the French Metric System.

In furtherance of these objects that Society issued a circular to the people of the United States, and appended thereto its Constitution and plan of organization, which forms the basis on which the OHIO AUXILIARY SOCIETY has been founded. Both of these papers are given herewith in order that the reader may fully understand the origin and objects of the OHIO AUXILIARY SOCIETY.

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CHARLES LATIMER, 1st V. P. G. R. HARDY, Treas. LUCIAN I. BISBEE, Sec.

Center Office of the International Institute

FOR THE

PRESERVING AND PERFECTING WEIGHTS AND MEASURES,

No. 375 TREMONT ST., BOSTON, MASS.

TO THE CITIZENS OF THE UNITED STATES.

The Executive Committee of the International Institute, conceiving in some measure the munificence of the work on which it is entering, and confident that its benefits will receive full acknowledgment by the people, when they come to be informed of its mission and principles, desire to present to the citizens of the United States and the world at large, the potent and actual facts now at issue in regard to the subject of Weights and Measures.

In 1866 an Act passed our United States Congress legalizing the discretionary use of the French Metric system. What is this system? It is one based upon the French metre, and the metre was intended and enacted to be the ten-millionth of the quadrant of the terrestrial meridian of Paris. In the progress of geodesy and science, it is ascertained that the standard metre bears no exact relation to that quadrant; and although it is probably very nearly the tenth-millionth of the quadrant of the meridian in which New York lies, it is not probable that it is the ten-millionth of either of the three other quadrants of that meridian or of any quadrant of any other meridian. The fact is, that a *straight* line unit is the natural one for measure of straight lines, not a *curved* one; and the metre is therefore an arbitrary and unscientific standard.

A bill is now ready to be presented to the next Congress making compulsory the adoption of this arbitrary and unjust system—involving the loss of millions of dollars and years of labor in changing all the costly machinery, tools, standard gauges, etc., now in use—all

maps, charts and surveys; indeed, every kind of business, of all classes of mechanics, science and commerce, is involved. The enormity of such an act is inconceivable.

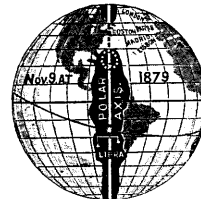
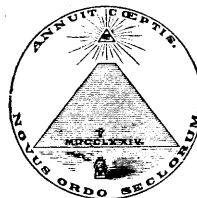
Prof. Davies, of Columbia College, declared the French Metric system "to be inapplicable to the ordinary affairs of the mass of humankind, being full of errors of science, and requiring innumerable patchings in practice to make it hold water at all." Subsequently President Barnard, of the same College, states that "the French Metric system ought to adopt, and doubtless would adopt, not their superficial earth-measure, the metre, but the Great Pyramid axial reference of the cubit, on account of its immense superiority in science."

We invite and solicit correspondence, and the organization of Associations in accordance with the subjoined Constitution.

Communications should be addressed to

L. I. BISBEE, Secretary,

No. 375 Tremont St., Boston, Mass.



THE INTERNATIONAL INSTITUTE

FOR

Preserving & Perfecting Weights & Measures.

INTERNATIONAL CONSTITUTION AND BY-LAWS.

ADOPTED BY VOTE PASSED IN THE OLD SOUTH CHURCH,
BOSTON, MASS., AT NOON, NOVEMBER 8, 1879.

I—NAME This organization is named The INTERNATIONAL INSTITUTE FOR PRESERVING AND PERFECTING WEIGHTS AND MEASURES.

II—OBJECT. Advised by our Counsellors—Prof. C. PIAZZI SMYTH, F. R. S., London, Astronomer Royal for Scotland; CHARLES LATIMER, Chief Engineer of Atlantic and Great Western Railway; and Rev. JOSEPH WILD, D. D., Author and Lecturer, Brooklyn, N. Y.

We hereby organize actively to promote the knowledge of and allegiance to our ancient standard of Weights and Measures, according to the Divine Command—"Thou shalt have a Perfect and Just Weight, a Perfect and Just Measure shalt thou have: that thy days may be lengthened in the land which the Lord giveth thee."—Deut. 25: 15. The adjustment and harmonizing of other and no less grievous impediments to trade and commerce will, in due time, engage the interest of the Institute. The membership will participate in all worthy efforts to arrest the progress of the French Metric system.

III—PLAN. The plan of organization comprises an International Institute, National Auxiliary Societies, and Affiliated Associations—The International Institute to be incorporated under the laws of the State of Massachusetts.

The International Institute, in its Executive Department, comprises America, (where is located the Center Office, in Boston, Mass.) Great Britain, Ireland, France, Germany, Russia and other nations, each of which *National Parts* of the International Institute is designated by its respective national name.

Auxiliary Societies are to be formed throughout the domain of each of said National Parts, after the election of their officers under the Constitution granted by the International Institute. For example—in the United States an Auxiliary Society is to be established by the American International Institute in each of its States and Territories.

Affiliated Associations are to be formed by the Auxiliary Societies in every City, Ward, Town and Village in its domain, through traveling and local lecturers.

Each National Part to be responsible for its own financial obligations—making such pecuniary contributions as each may determine. For example—If the English Part of the Institute should receive large gifts or bequests, it acts its pleasure about contributing to the pecuniarily weaker Parts of the International Institute.

The Institute will supply THE INTERNATIONAL STANDARD (a monthly magazine, at \$1 per annum), also, books, charts, printed matter and other appropriate material, to all Societies and Associations, at discount from publishers' rates, for diffusing essential knowledge in accomplishing contemplated results; and it may collect and expend all necessary funds or properties therefor.

The Constitution for Auxiliary Societies is granted by the International Institute, which is adapted from their Constitution to facilitate the work of organizing Affiliated Associations—thus securing complete unity of action, and leading, we hope, to a FEDERATION OF NATIONS.

When expedient, the International Institute will form Affiliated Associations by electing a Secretary, residing in the place, who will efficiently complete the organization under the granted Affiliated Constitution; which will report to the International Institute till requested to report to the Auxiliary Society to which it shall belong.

IV—OFFICERS AND THEIR DUTIES. The officers shall be the

three Counselors, as before named, a President, one or more Vice Presidents, Secretary, Treasurer, and five or more Trustees. Also, a Finance Committee of three members, to be elected by the Board of Trustees, who shall have charge of all funds except fees and Depository moneys.

The President (or in his absence a Vice President), Secretary and Treasurer shall constitute the Executive Committee.

A person may hold more than one office, providing there may still be three individuals on the Executive Committee.

The President of any Auxiliary Society shall be ex-officio Vice President of the International Institute, who is expected to be instrumental in organizing an Auxiliary Society for his State.

All officers shall be elected annually, by a majority vote of those attending, or represented by a letter vote, or authorized proxy, at the annual meeting in November, or at any regular meeting called for the purpose of filling vacancies.

The Secretary shall have charge of all records and correspondence of the business of the Institute or of any of its committees.

The Treasurer shall keep the funds of the Institute, and make the disbursements on the order of the Secretary; providing always that they are to be charged to the proper appropriation voted by the Executive Committee or by the Institute.

All votes making appropriations must be attested by three members of the Executive Committee, and placed on file with the Treasurer.

Three members of the Executive Committee, including a President or Secretary, may constitute a quorum qualified to appropriate for any object an amount not exceeding one hundred dollars; or to call meetings or votes of members within not less than seven days.

Vacancies may be filled *pro tem.* by the vote of the remaining members of the Executive Committee.

V—MEETINGS. It shall be the duty of the Executive Committee to have a call issued annually for a meeting for election of officers in November; but this meeting may adjourn to collect votes by letter, or authorized proxy, on elections or other business.

Five votes will constitute a quorum, but three may adjourn from time to time.

VI—BUSINESS MEETINGS. The regular order of business at an Institute meeting shall proceed as follows, unless otherwise voted;—

Reading of minutes of the last meeting.

Elections of members and officers.

Reports of officers and committees.

Other business.

Unless otherwise voted, all meetings shall be held at the office of the Institute in Boston.

A Board of Trustees (seven or more) may be elected annually by the Institute, who shall hold in charge all bequests and property, not including fees or assessments.

VII—MEMBERS. Any person may become a member of an Affiliated Association on paying a yearly fee of two dollars—one dollar belonging to the Association, and one payable to the Institute. Five dollars per annum, paid to the Institute, will entitle the member to all the papers issued in current year by the Institute. The payment of not less than twenty dollars will constitute a life-membership, exempt from all further payments.

Any person who shall be elected an honorary member shall not be assessed, but whose co-operation in promoting the objects of the Institute is expected.

VIII—AMENDMENTS. Any part of this Constitution, excepting the first three articles, may be amended by a two-thirds vote, at a regular meeting; notice having been duly given to all members of the proposed change, and votes by letter, or authorized proxy, to be counted.

Special Notice.—Constitutions for Auxiliary and Affiliated Associations can be readily adapted to their respective localities from that of the International Institute.

Stated or special meetings may be made of great interest and profit to the membership by the communication and discussion of new phases of interest in the prosecution of the work of the local Associations in harmony with the International Institute.

PROCEEDINGS
OF THE
OHIO AUXILIARY SOCIETY
FOR
PRESERVING AND PROTECTING WEIGHTS AND MEASURES.

PRELIMINARY MEETING.

A meeting of gentlemen assembled at the Board of Education Rooms, Cleveland, O., Wednesday, December 3d, 1879, for the purpose of organizing a Society for opposing the introduction of the French Metric System into this country, and Auxiliary to the International Institute, when Mr. Chas. Latimer was called to the chair, and C. G. Force was appointed Secretary.

After a short prayer an address was delivered by the chairman, in which he substantially stated the reasons for the present movement. He then read the following as a part of:

An Appeal to the People of the United States:

A determined effort is being made by some scientific men and societies in this country to utterly overthrow our system of weights and measures and substitute the French metric system. For this purpose they have been working upon Congress for years, and are now doing so, and a special effort will be made to have a law passed

at the present session, making the use of the French system obligatory in the departments of the Government. This is the entering wedge. It is vital to your interests to oppose with all of your power this innovation, which if successful will bring confusion, damage, and shame to our people, utterly destroying the value of our present records and the standards of weight and measure, used in every house and shop in the land. We call upon all citizens and all people to rise up and oppose this French system. In order to make a decided and systematic stand against it, and for the preservation of our hereditary units, and perfecting them according to the best wisdom of the present and of the past, a society was formed in Boston, Mass., on the 8th day of November, 1879, entitled "International Institute for preserving and perfecting weights and measures," office No. 375 Tremont Street, Boston. This society is in favor of a decimal system founded upon our present units, without necessarily abolishing duodecimals. These units have varied little in ages and are capable of being made complete and perfect without the direful consequences of overthrow, and for this purpose this society and institute is formed, desiring to avail itself of the combined wisdom of the people and through it and a study of the monuments of the past accomplish the objects of its organization. We hope that every one who loves his country will think this a part of his work and duty, and organize with auxiliary and affiliated societies in every city, ward, town, and village in the land.

The constitution of the International Institute of Boston, Mass., was then read as the basis for this organization, of which it was proposed to be an auxiliary and under the name of the Ohio Auxiliary Society for Preserving and Perfecting Weights and Measures.

The chairman then proposed that all who were in favor of such an organization should signify the same by rising; which was responded to by the following persons present:

Messrs. Holloway, Rawson, Rice, Latimer, Force, Whitelaw, Kingsley, Rulison, Wainwright and others. The organization then proceeded to the election of officers. Mr. J. H. Devereux's name being presented for president, was seconded, and the gentleman unanimously elected. Mr. E. M. Rawson was then nominated and elected treasurer. The election of the remaining officers, was postponed till the next meeting, which, was arranged to be held on the next Wednesday evening at 7:30 o'clock at the same place.

REGULAR MEETING OF THE SOCIETY, DEC. 10, 1879.

The second meeting of the Society was held on Wednesday evening in the Board of Education rooms. In the absence of General Devereux, the President, the chair was occupied by Mr. J. F. Holloway. After prayer by M. Latimer, the minutes of the preceding meeting were read by Secretary C. G. Force. An invitation was extended to those present who had not already joined to become members. A considerable addition was received to the membership, which now comprises the following:

President—General J. H. Devereux.

Vice President—J. F. Holloway.

Secretary—C. G. Force.

Treasurer—M. E. Rawson.

Other members—Charles Latimer, M. W. Kingsley, John Whitelaw, N. S. Rulison, W. P. Rice, D. E. Shongo, John Wainright, J. M. Blackburn, H. J. Herrick, J. T. Parkhurst, Ethan Rogers, R. H. Boggis, L. Austin, P. D. Cooper, C. S. Baldwin, William Bingham, jr., James Barnett, H. S. Allen, R. H. Lewis, L. M. Coe, L. H. Brewer, W. J. Boardman, C. A. Walter, B. F. Morse, N. P. Payne, Fayette Brown, Harvey H. Brown, H. C. Ranney, John Tod. Professor Stockwell, H. M. Claffin, Chas. Heiss, Geo. C. Davies, R. H. Lewis, Wm. Bingham.

The Constitution of International Institute, Boston, was read as the basis of organization of the Society, but no formal action was had in relation to it.

A large number of gentlemen being present who did not attend the first meeting, Mr. Latimer explained the objects expected to be accomplished by the organization.

Mr. Whitelaw, from committee on rooms, asked further time to report, which was granted.

The Secretary suggested the necessity for the creation of the office of Corresponding Secretary. The consideration of which was deferred to next meeting.

Mr. Latimer then read an essay on the metric system, entitled,

THE METRIC SYSTEM,

OR

THE BATTLE OF THE STANDARDS.

a full report of which is given in the appendix.

After finishing his essay, Mr. Latimer quoted from an official letter from the Secretary of the Treasury, in reply to a resolution of Congress, passed in 1877, asking for opinions of the heads of departments, in regard to the introduction of the Metric System, the substance of the replies of each, in order to show the confusion that would follow its introduction.

The following were the questions submitted:

What objections are there to making the metrical system of weights and measures obligatory? How long a preliminary notice is necessary for the same without detriment to the public service? What objections are there, if any, to make the same system obligatory between individuals and what is the earliest date that can be set for such obligatory use throughout the United States? From the answers returned we make extracts as follows:

The Secretary of State—Would be of no benefit with regard to the countries which have not adopted it and especially with Great Britain and other countries where our present system is in use, with which countries the bulk of our foreign commerce is carried on. In France, where the system has been obligatory beyond the memory of the present generation, the tradition of the old system clings among the people and defies complete eradication. It would take five years.

The Secretary of the Navy—It would involve a total loss of all charts and chart plates now in use. It would be prejudicial to the free exchange and use of English charts, so essential to navigators. A mutual disadvantage would result. The geographical extent of this people forbids it.

The Postmaster General—The expense immediately would be \$124,788. It is objectionable on account of the expense and the lack of practical knowledge of the system by the postmasters and the public at large.

The Secretary of War, through the Inspector General—The compulsory change would be inexpedient, involving a large outlay without any adequate result. Through the Quartermaster General—It will very considerably increase the labor of computation; will infallibly cause mistakes; will require the loss of all hay and other platform scales; if obligatory on the government and not on individuals, confusion and misunderstanding will be caused; the people will not change

their customs at the call of the officers of the United States; it will be looked upon by the people as an arbitrary and unjust interference; it is not within the power of Congress; it will inflict great loss upon many, especially upon manufacturers and mechanics, whose shops are filled with costly tools, standard gauges, dies and machines, all constructed upon the basis of the foot and inch; every geared lathe in the United States depends upon a screw of a certain number of threads to the inch and all the screws it produces are gauged in pitch and diameter by the inch, the meter is not commensurate with the inch, foot or yard; to alter all the machines, engines, etc., will be the work of years and cost millions; the metric system is not convenient for common use; the yard, half the stature of a man, is of convenient length to handle, to use, to apply and the goods measured by it can be halved, quartered, subdivided into eights, sixteenths, thirty-seconds, sixty-fourths, etc., and can be with equal facility divided into tenths, hundredths, thousandths; half a meter is no dimension, half a centimeter is an unknown quantity, but a half a yard, half a foot, half an inch, half a bushel, one-quarter of a bushel, of a quart, of a pint, etc., are recognized; if half a litre, of a delitre, or a quarter, eighth or sixteenth of these quantities is provided for; then the metric decimal system is abandoned at once; the ciphers and figures 0.00000073 convey no idea to a mind trained in the English and American system, yet such combinations are common in French works of science and mechanics; the true scientific natural basis of the metric system has been abandoned; the meter was intended and enacted to be the ten millionth of the quadrant of the terrestrial meridian of Paris; in the progress of geodesy and science it is ascertained that the standard meter bears no exact relation to that quadrant; the meter is quite as arbitrary and unscientific a standard as foot or yard; it is of less convenient length than either of them; it is compulsory adoption would derange the titles and records of every farm and of every city and village lot in the United States, would put every merchant, farmer, manufacturer and mechanic to an unnecessary expense and trouble and all for the sake of indulging a fancy only, and a baseless fancy of closet philosophers and mathematicians for a scientific basis of weights and measures which is not what it professes to be and cannot be found in the French metric system.

The Surgeon General—In all medical and surgical works of any importance printed in the English language the doses are expressed in apothecary's weights and measures. The substitution of metrical weights and measures would force a series of mathematical calculations every time an attempt was made to use the prescriptions or doses laid down in any medical work written in the English language. This thankless and unnecessary labor would waste much precious time and an error might cost life.

The Commissioner of Subsistence—The people would look with grave suspicion upon government transactions based on a system of weights and measures which they do not understand. To adopt the system by the government would remove it further from the people and weaken if not destroy their confidence in government officials.

Mr. Latimer summed up by saying that the French metric system is unscientific; is founded on a curved line instead of a straight line; is based on the particular meridian of Paris out of the infinite number; is inaccurate and untrue; is inharmonious with nature; is bi-lingual; its terms are cumbersome and long; its unit of length is not a natural stride and has no reference to personal measures; it is offensive in its religious relations; it is furthest removed from the sacred system of weights and measures and of all known systems; we have a better system now, so closely allied to that of the great pyramid, to which it would be perfectly practicable and easy to refer all weights and measures; the adoption of the French System by us would be practically and profoundly oppressive.

When Mr. Latimer finished he was roundly applauded. A letter was then read from General Ellis, a distinguished engineer and scientist of New York, expressing gratification that the people are taking a common sense view of the unfitness of the French metric system to come into common use. He says that in the coast and lake surveys where both systems are used things are so complicated that the officers themselves do not know the real length of anything.

The society adjourned to meet in the same place on Wednesday evening December 17.

REGULAR MEETING,

Dec. 17, 1879.

In the absence of the President the meeting was called to order by the Vice President, who called upon Mr. Latimer to open the meeting with prayer.

The minutes of last meeting were read and approved.

In pursuance to a suggestion made at last meeting, the Chair appointed Messrs. Rogers, Parkhurst and Blackburn, a committee to nominate a suitable person as Corresponding Secretary.

The Chair also on motion named Messrs. Latimer, Whitelaw and Davies a Committee to nominate three trustees for the Society.

Messrs. Latimer, Force and Davies were appointed by the chair a Committee to revise the temporary constitution adopted at the first meeting of the Society and to report a suitable Constitution on same basis for its government.

The Committee on Trustees was on motion requested also to name a suitable Executive Committee.

The Committee subsequently through its Chairman reported the following :

EXECUTIVE COMMITTEE—Messrs. J. H. Devereux, C. G. Force, J. T. Pankhurst, Patrick Collopy, Chas. Hies.

TRUSTEES—H. M. Claflin, Edwin Cowles and Fayette Brown.

The election of new members being next in order, the names of the following persons were presented, who on motion were duly elected :

W. J. McKinney,	C. C. Ruthroff,	Thos. Wann,
H. C. Ranney,	John Tod,	Edwin Cowles,
R. C. Parsons,	Russell Botsford,	Dr. X. C. Scott,
Wm. H. Price,	S. Randall,	E. S. Page,
J. McIntyre,	Patrick Collopy,	Rev. C. S. Pomeroy,
John Huntington,	Rev. P. S. Moxom,	Frank Ford,
Henry Wick,	Chas. Bernard.	G. W. Billings,
Gen'l H. H. Dodge,	W. B. Chisholm,	T. J. Higgins,
Wm. Chisholm.	M. B. Clark,	Stewart Chisholm,

On motion of Mr. Blackburn, the Secretary was authorized to purchase the necessary stationery, blanks, &c., for the use of the society. He was also directed to procure proper blanks, &c., to notify all members of their election, and to whom to pay their dues.

On motion of Mr. Latimer, the society resolved itself into a special committee to canvass the city for membership.

The chairman of committee on permanent rooms, reported that the Young Men's League Rooms could probably be secured, and recommended that the next meeting of the society be held at that place, which was agreed to.

The routine business of the society being concluded, Mr. Geo. C. Davies read the following paper on the improvement of weights and measures as follows:

PERFECTING WEIGHTS AND MEASURES.

AN ESSAY READ BY GEO. C. DAVIES, BEFORE THE OHIO AUXILIARY SOCIETY AT CLEVELAND, DEC. 17, 1879.

As one of the primary objects of your society is the perfecting of weights and measures, I trust no apology will be necessary in calling your attention to some suggestions by which the elements of weights and measures in daily use, may be applied in a simpler and more convenient manner than is now practiced.

As no reform can be successful unless it be based upon the existing state of affairs which it is proposed to reform, it will be advisable in the outset of our inquiry to take a survey of the elements with which we have to deal.

In examining the tables of weights and measures as given in our school books, we find the following terms applied to measures of length, viz: Line, Barleycorn, Inch, Span, Foot, Yard, Ell, Fathom, Rod, Chain, Furlong, Mile, Nail, Palm, Hand, League, Cable-Length, and Geographical or Nautical Mile, Link, Pole, Perch, Cubit and Knot, in all twenty-two. There may be more.

In measures of value or capacity, we have the liquid Gill, Pint, Quart, Ale Gallon, Wine Gallon, the fluid Minim, Drachm and Ounce, and the dry Pint, Quart, Gallon, Peck, Bushel and Chaldron. In addition to these there is a long list of Kegs, Firkins, Kilderkins, Barrels, Casks, Pipes, Butts, Hogsheads, Octaves, &c.

In measures of weight we have the Avoirdupois Drachm, Ounce, Pound, Stone, Quarter, Cental, Hundred Weight, Net Ton, Gross Ton, Foundry Ton and Miners Ton, and the Troy Grain, Pennyweight, Ounce, Pound and Carat, as also the Apothecary Grain, Scruple, Drachm, Ounce and Pound.

In land and surface measures, we find the Link, Chain, Pole, Perch or Rod, Rood, Acres and Sections, and Square Mile.

In measure of Grain, Seeds, certain Roots, &c., as well as Lime, Charcoal and other crude commodities there are other arbitrary

standards, generally fixed by state laws, which frequently differ from the standard in other states. There may be other measures and other terms. But the above will be sufficient to show the very unsatisfactory state of our system of weights and measures.

It will be seen in examining this long list of names, that not one of them conveys any idea of the number of units of which it is composed, nor does it give any indication of what that unit is. Then too, similar names are given to measures and weights of different capacities, and a useless classification of weights and measures for different commodities. It is not to be wondered at, therefore, that the advanced thinker should demand a new and better order of things.

Now if we examine critically the French Metric System, we shall find that its merits consists mainly in the fact that there are but one set of terms for all measures of length; another for all measures of capacity; one for all measures of weight, another for land and another for timber, wood, stone, &c., in all five, viz: *Meter, Liter, Gramme, Arc and Stere*, and in the further fact that each of these terms is the name of the unit of its own class. With the six Greek prefixes each term clearly defines the number of units of which it is composed—whether divisions or multiples—This list comprises in all, thirty terms. Beyond these it will be difficult to discover any special merits that cannot be engrafted upon our own standard. True, great merit is claimed for its decimal character; but I have yet to discover wherein the French metrical decimals in every day practice, have any great advantage over the methods adopted by engineers, accountants and draughtsmen with the American standard as now used. Should any one doubt this let him test the matter practically for several days and he will probably find that he can make as many calculations with our measures, as with the French. Later we shall refer to this subject again.

It might at first sight appear as an almost hopeless task, to bring anything like order out of the jumble of unmeaning names which has been given as our system of weights and measures. But let us see what can be done. It may not be as difficult as it seems.

To begin, let us take up the table of linear measure, and see what we can do with that. Suppose we strike out all the superfluous or

little used terms—say line, barley-corn, nail, palm, hand, span, ell, furlong, league, cubit and the technical terms, knot, fathom, cable, length, nautical mile, link, rod perch or pole and chain, we shall have only four terms left, viz: Inch, foot, yard and mile, as elements for all measures of extension, whether linear, superficial or solid. But which of these shall be the unit? In England the yard is the official standard from which the foot, inch and mile have been deduced, though the inch was used in determining it. This, however, I conceive to be too long and has the same defect in that particular as the French meter—a defect that was speedily discovered by the originators of the French system when they came to the units for capacity, weight land and wood. Suppose we take the smallest of the dimensions, the inch as our unit, and let the foot and yard be multiples, and the mile a multiple of the foot. By dividing the inch and foot into 100 parts each, we shall be able to measure all conceivable dimensions, and to express them in language and figures that can be read and understood by every one having a knowledge of our language. Our table of long measure then would be as follows:

12 inches equal 1 foot; 3 feet equal 1 yard and 1760 yards, or 5280 feet equal one mile.

The inch, foot, yard and mile are household words, in hourly use and well understood, with their ordinary subdivisions and multiples, as before said, any conceivable dimension can be plainly and easily written. Are any other terms needed? I think not.

As to the propriety of making the inch the unit of measure, persons may differ—presumably because it is not, or supposed to be not represented by some original quantity existing or supposed to exist in nature. Neither is the yard nor the meter. For all practical purposes the inch is just as much of an original quantity as either of the others. Nay, more the inch is claimed by some as of divine origin and preserved in the pyramids by the wonderful skill of the old Egyptian architects 4000 years ago. Whether this be so or not, it is a matter of not the least practical importance. Its precise dimensions will be found to be one thirty-sixth part of a certain brass rod in the possession of the Clerk of the English House of Commons and bearing the legend:

“STANDARD YARD 1760.”

This rod was declared by act of Parliament in 1826, to be the “Imperial Standard Yard” at a temperature of 62 degrees Fahrenheit, and made the basis of all measures of extension, whether linear, superficial, or solid. At the same time it was officially declared that one third of this yard should be one foot, one-twelfth part of a foot, one inch, and 1760 yards one mile. It was also ordered that a cube of brass representing the precise dimensions of the inch be prepared and placed in the keeping of the Clerk of the House of Commons, to be referred to us as the standard inch. I am not prepared to state positively, but I believe duplicates of these standards have been prepared at the request of our Government, and are now in one of the Departments at Washington. In case of disputes we shall all know where to find the official Standard.

The source from whence the above mentioned standard yard is derived is by no means clear, it having been in use for ages before it was authoritatively declared. About the middle of the 18th century, various committees were appointed by the English government, and many of the most learned men in the realm devoted years to the subject, and made innumerable experiments for determining a scientific basis for a standard unit. The result was the yard of 1760 above mentioned. Whether this yard was derived from any natural standard, from tradition, from the dimensions of the human frame or other source it is not necessary to inquire. It is not improbable, however, were the real facts known, that the particular yard stick referred to represents the average length of various yards sticks in use in different parts of England at that time—the lengths of these yard sticks being traditional from time immemorial.

From what has been said it is apparent that if we simply strike off what is superfluous in our table of linear measure, and take for our unit the standard inch, we shall have the simplest and best system for measuring all dimensions in use in any country: namely, the inch divided into halves, quarters, eights, sixteenths, thirty-seconds and sixty-fourths as now, for ordinary use and into tenths, twentieths

and one-hundredths for engineers architects and draughtsmen; the foot into inches halves quarters, &c., for common purposes, and into decimals for engineering and other scientific purposes, the yard into halves, quarters and eighths, while the mile can be subdivided into halves, quarters, eighths, etc., at pleasure.

In this arrangement it is true, we have nothing of the decimal system, save the sub-divisions of the inch and foot. But is a decimal arrangement necessary for a perfect and convenient system of measures? Or is it the best for ordinary, every day use. Doubtless, those who know the least about it practically, or who speak abstractly could say "yes" while those who have given it the most attention and have the largest practical experience will most probably hold a contrary opinion. Upon this point nothing better can be said than was given in a report by a committee of Savans appointed by the English government in 1818. This committee consisted of Sir Joseph Banks, Sir George Clerk, Mr. Davies Gilbert, Dr. W. Hyde Walliston, Dr. Young and Captain Henry Kater, all well known and celebrated scientists. In reference to the decimal system the Committee says: "The subdivision of the weights and measures at present employed in this country appears to be far more convenient for practical purposes than the decimal scale, which might be preferred by some persons for making calculations with quantities already determined. But the power of expressing a third, a fourth, and a sixth of a foot in inches without a fraction, is a practical advantage of the duodecimal scale; and for the operations of weighing and measuring capacities, the continued division by two renders it practical to make up any given quantity with the smallest possible number of standard weights or measures, and is far preferable in this respect to any decimal scale. We would therefore recommend that all the multiples and subdivisions of the standard to be adopted, should retain the same relative proportions to each other as are at present in general use." These are words of wisdom and cannot be gainsaid. I wonder if it has ever occurred to the advocates of the decimal system, that men, the masses of men who have the most to do with these things, cannot think in decimals, however ready they may be in mental arithmetic with halves, quarters and the other sub-divisions and multiples of our weights and

measures? Operations with decimals must generally be performed on paper, not always convenient in the hurry and bustle of trade.

There are those who are opposed to the French system, yet seem to be anxious for a decimal system of some sort. To satisfy these gentlemen we might adopt a ten inch or decimal foot, or a foot one-sixth shorter than the one now in use, whereby the latter would become one and two-tenths and the mile 7336 decimal feet. But I can conceive of no practical advantage in such a foot, except it may be to facilitate calculations, when a large number of broken numbers of feet and inches—involving cross-multiplication—is concerned. But those having such operations to perform, have or should have mathematical skill sufficient to calculate in one system as well as an other.

Now if we turn to the tables of weights we shall find an equally confused state of affairs. By treating them in a similar way, and striking out the useless terms say, Stone, Drachm, Quarter, Hundred weight, Gross Ton, Foundry Ton, Miners Ton, we shall have left of the Avoirdupois weights the ounce, pound, cental and ton of 2000 lbs. and following the example of France we decide to have but one series of weights, and that the Avoirdupois, we shall strike out all that relates to Troy and Apothecaries weights as superfluous, save the Troy grain, which we make the unit of our system. The precise weights of this grain has been fixed by the English law by declaring that the weight of nineteen cubic inches of water, at the temperature of 50 degrees Fahrenheit, shall be divided into 4800 parts and that each of such parts shall constitute one grain, and that 7000 such grains shall make one pound avoirdupoise. By the same law the pound was divided into sixteen parts, or ounces of $437\frac{1}{2}$ grains each. This being done, we shall have left the grain, ounce, pound, and the cental of 100 lbs, and the Ton of 2000 pounds, with these, I can conceive of no possible difficulty, with suitable scales and weights of determining the weight of any and every commodity on earth, from the costly diamond to the least valuable coal, or earth heap.

On turning to the tables for measures of capacity whether fluid, liquid or dry, we shall find "confusion worse confounded" and were I autocrat, I should untie the knot by cutting it, and abolishing the whole system of measures of capacity, and in lieu thereof substituting

the avoirdupois scale and sell every thing by the pound, cental or ton. This may seem like a reform with a vengeance! Perhaps at first sight it may be deemed impracticable, or impossible to buy and sell all our drinkables and eatables by weight. But on reflection it will doubtless be found that it is the most simple and accurate method that can be devised. The English Commission for investigating the subject, appreciating the extreme difficulty of determining the dimensions of measures of capacity, hit upon the simple method of taking ten pounds of Thames water at 62 degrees, as the Imperial Standard gallon. Had this Commission gone one step further, and recommended the buying and selling of all commodities, whether fluid, solid or mixed by weight, they would have hit the "nail on the head," and cut off at a single blow all chances now so common, for frauds in measuring liquors, oils, &c.

A single illustration of the application of this system to practice will be sufficient to give a clear idea of its simplicity and desirableness. Suppose Congress were to change the tax on spirits from so much per gallon to so much per pound, the different specific gravities or proofs being duly provided for. Instead of an army of gauges, with their little graduated rods guessing at the contents of the different barrels and casks, a suitable weigher was appointed to weigh and brand every package before being filled. Then when turned out of the distillery for shipment or warehouse, the number of pounds in the contents could be ascertained beyond any possibility of fraud, by simply placing them upon a suitable scale. So in matters of every day life. A merchant buys or sells a cargo or car load of wheat. This is now weighed; but strange to say, sold by an arbitrary quantity called a bushel. Why not sell or buy it by the pound, or cental, or ton, which amounts to the same thing. Why hold on to a custom invented when weighing of grain was unknown, or was unthought of?

In the measure of lands, I do not know that any changes are necessary. These measures are used almost exclusively by a specially educated class, who understand fully their application. Besides all our lands, roads, streets, railways, &c., are matters of record in the terms now in use, and any change in the unit would not only be a matter of confusion, but most probably of utter impossibility.

Should these suggestions be adopted, we should have

One set of measures for all dimensions, whether linear, superficial or solid.

One set of weights for all commodities, whether liquid, fluid or mixed.

And one set of measures, based on the lineal above given, for land.

I can conceive of nothing more simple nor more convenient, either for every day or scientific uses; at the same time entirely within the reach of the most ordinary intellect.

Should it be deemed advisable to have a decimal or ten inch measure, we might give such an one a distinctive term as *decifoot*, though the Scripture term "Span" which it approximates would be preferable.

Should we wish to carry the decimal system in that of weight we might adopt one tenth of a pound, or 700 grains as a new term, and which for convenience may be given any suitable name as for instance, Tenth or Onza.

Now if we suppose these suggestions to be carried out, we should have the following, which we might for the sake of distinction designate as the "International Institute System of Weights and Measures," namely:

MEASURES OF EXTENSION.

UNIT, THE BRITISH INCH.

10 Inches equal.....	1 Span
12 " "	1 Foot
36 " or 3 ft. equal.....	1 Yard
1760 yards or 6336 spans or 5280 ft.....	1 Mile.

* * * All measures of extension, whether linear, superficial or solid, are to be determined by the above, except land which being matter of record is to be determined as now.

MEASURES OF WEIGHT.

Unit the Grain Troy, equal to .003961 cubic inches
Distilled Water.

700 Grains equal.....1 Tenth or onza.
10 Tenths or onza or 7000 grains.....1 Pound.
100 Pounds equal.....1 Cental.
20 Centals or 2000 lbs.....1 Ton.

By this all commodities, whether solid, fluid or dry are to be determined.

It will be seen from the above that in this scheme we have only five terms, the inch, span, foot, yard and mile for all measures of extension, and only five for all measures of weight or of capacity, namely the grain, onza or tenth of a pound, cental and ton. Can anything be simpler, more convenient or exact, or more readily adapted to every requirement of trade, commerce or science; at the same time entirely familiar to all English speaking people. Should it be deemed advisable the present ounce or one-sixteenth of a pound may be retained as adapted to the use of scales and weights now in general use.

Mr. Davies' paper was informally discussed by a portion of the members. After which Mr. Latimer made a motion that the chair appoint a committee of three to devise suitable emblems or devices to print upon the stationery and blanks of the society. The chair appointed Messrs. Devereux, Heiss and Blackburn said committee.

On motion of Mr. Whitelaw, the thanks of the Society were tendered to Mr. G. C. Davies for the valuable and suggestive paper read by him, and to the daily papers for their kindness in publishing the Society notices, reporting its proceedings &c., and to the Board of Education officials for the use of their rooms.

On motion the time of next meeting was fixed on January 7th, 1880, at the Young Men's League Rooms, and that the Secretary give proper notice of the same through the papers. Adjourned.

REGULAR MEETING,

Jan. 7th, 1880.

The Society met on Wednesday evening in the rooms of the Young Men's Republican League, in Crocker Block. In absence of President Devereux, the chair was occupied by Vice President Holloway. After an invocation by Mr. Charles Latimer, Chief Engineer of the Atlantic & Great Western Railway, the minutes of the previous meeting were read by Secretary Force.

Additional members were elected as follows: Amos Townsend, Charles H. Strong, J. H. Wade, A. M. McGregor, Levi T. Scofield, C. Schuenhut, Dr. I. N. Dalby, D. E. Stone, N. E. Adams, A. Starkey Bishop G. T. Bedell, E. B. Thomas, N. S. Cobleigh, William Downie Rev. Dr. J. A. Bolles.

The committee on design to be adopted by the Society reported. The design submitted includes two scales illustrating the decimal and duodecimal systems, a globe showing the polar axis of the earth, the reverse of the great seal of the United States and the name and date of organization of the parent society—the International Institute for Preserving and Perfecting Weights and Measures. The report was received.

The subject of this design was a topic of much controversy, a difference of opinion existing as to the propriety of placing any symbol whatever on the stationery of the society. Some thought the paper and envelopes should be left plain, others feared that the symbols might mystify persons seeking to become members. Those who opposed the adoption of the symbols frankly admitted that they do not understand them, not having giving them study, and wished to be relieved of the dilemma of having to acknowledge the fact to strangers whom they might be seeking for members. On the contrary those who had given attention to the significance of the symbols were more or less favorable to their adoption as emblems, those most familiar with the subject being enthusiastic in regard to the world of beautiful meaning unfolded to the initiated by every character and even measurement of those symbols concerning antiquity, the justness, the proportion and even the divinity of our ancient standards of weights and measures.

The question of acceptance of the design was deferred until the next meeting in order that all members who choose may post themselves on the significance of the symbols, which are not only striking to the eye but furnish to the defenders of the present standards weighty arguments why those standards should be preserved, arguments above and beyond all reasons of mere convenience or confusion, based upon pure scientific principals as well as fortified by tradition and preserved for all time in a conservatory more nearly imperishable than anything else known to man.

Mr. Charles Latimer read the following circular letter from the parent society to manufacturerers, mechanics and agriculturists.

The International Institute for Preserving and Perfecting Weights and Measures has been organized to diffuse more general knowledge and secure efficient action from the people in regard to the hereditary standards of weights and measures now used in Great Britain and the United States and other countries, as they were originated and have been identified with the history of the human race and confirmed by the revelation and experience of ages.

There exist a pressing and urgent necessity for immediate action by the people in behalf of our hereditary system as against the French metric system, whose persistant aim is to substitute a *new invention*, local and arbitrary in its nature, for our present system. It is the purpose of the Institute to preserve our tried and certain principles of equity and perfect their application to the uses and business of life, without undermining and sweeping away the strongholds and safeguards of popular and familiar national usages, as the incorrect and unnatural basis and foreign nomenclature proposed by the French system will do.

All commercial interests demand national and international uniformity in weights and measures—science and mechanism need it. But if we are to find unity in the adoption of a system worthy of universality, let us begin with a natural standard, and not with the indefinite measure of nothing in nature that we can accurately determine. Sir John Herschel says: "Nature presents to us but one material object which combines all the requisites essential to a universal standard, *i. e.*, the globe itself that we inhabit; and in that globe,

we find only two naturally defined lengths—the earth's polar axis and its equatorial circumference—its axis being divisible into five hundred million equal parts or geometrical inches.

The French metre standard is 39.370704 inches of the quadrant of a meridian passing through Dunkerque and Barcelona, in France. This illogical meridian bears no possible fitness or equality with the polar radius as an earth commensurable and universal standard. A straight line unit is the standard measure of straight lines and not a curved one. By this imperfect and arbitrary measure we are urged and Congress is solicited to make compulsory a system which utterly changes the whole land measurements and records of this Western continent since its first settlement. The unit of land measure by the French metre is the hectare—2.47114 acres. For our acre the French *are* [acre] makes about 40 acres or a quarter section of 160 acres will make 6,400 acres. A piece of ground 25 feet front by 100 feet deep will be described as seven metres, six decimetres and two centimetres front, by 30 metres, four decimetres and eight centimetres deep—being a numerical increase of aggregates which nullifies utility; and such descriptions must always prevail in the change of our preagent measurement by the French measures.

Every engineer is aware of the great importance of accuracy. Every geared lathe in the United States depends upon a screw of a certain number of threads to the inch, and all screws are guaged in pitch and diameter by the inch. Can your mechanics and manufacturers bear the years of vexatious confusion and the loss of millions of dollars in changing the standards of their costly machinery and tools?

The French liquid measure, the litre, is 0.26418635 gallons or 1.0567454 quarts, or 2.1134908 pints. Can all our manufacturers who make and use hogsheads, barrels, etc., willingly or compulsively accept the changes involved in adopting new sizes of casks and measures to suit an indefinite standard?

Thus we might continue to illustrate how completely sweeping and revolutionizing this French system must be to all the industries

of art, science, manufactures and commerce wherever adopted. Nay even France itself cannot at home enforce its practical details. The real truth, the undisguised fact is that a scale of measurement cannot be produced from 39.37079404 inches. The foot of 12 inches admits of equal divisions, but the French metre does not. The universal constitution of nature requires the use of decimal and duodecimal numbers and neither science or mechanism will yield their god-head of power to please the infidelity of a metre derived from a curve which has no regular radius in any two consecutive degrees and whose subdivisions are the unequal parts of an unequal fraction of a demonstrable uncertainty in nature, wherein the eternal certainties rules. This is the metre that is to become the world's standard, is it? The people have not yet so determined.

It is admitted that the French metric system is of easy application upon its decimal basis but our present unit, with its tens, hundreds and thousands, is equally so. For instance, our paper manufacturers, without any detriment to their own interest and to the great advantage of printers [their principal customers] can readily make 500 sheets to a ream instead of 480. The entire disuse of our state shilling currency and the adoption of United States currency on the basis of 100 cents to the dollar would require no sacrifice but the name.

Surely it is necessary that some combined action should at once be adopted to secure the public welfare against a possible result fraught with such vast and complicated disturbances of our national and international prosperity.

The co-operation of all branches of commerce and manufactures is earnestly solicited to aid in securing the objects of the International Institute, and you are personally desired to forward to the Secretary such expressions of your interest on the question at issue as you may deem just and equitable together with the estimated probable or possible losses which might be entailed upon yourself or firm from the enforcement of the new French metric system of weights and measures—a bill for the compulsory adoption of which system

is now pending before Congress and which is receiving the personal attention of some of the officers of this institute.

L. I. BISBEE,
375 Tremont Street, Boston, Mass.

Letters in sympathy with the movement were read from General Norton, of the United States Army, Mr. George Paul, member of the State Board of Public Works, and Mr. Louis Miller of Akron.

Mr. Latimer stated that since the last meeting he had organized on invitation, a branch of the Cleveland Society in Galion, and that he is in correspondence with with persons in Akron, Youngstown and elsewhere who are moving to establish branch societies.

The Ohio laws, as comprised in the Revised Statutes, fixing standards of weights and measures were submitted and partially read. It was suggested that they be placed upon a card or a board or in some accessible shape for ready reference.

The meeting adjourned at ten o'clock to meet in two weeks [on the evening of Wednesday the 21st] in the same place.

REGULAR MEETING,

January 21st, 1880.

In absence of the President, the meeting was called to order by Vice President Holloway. After prayer by Mr. Latimer, the Secretary presented the following names for membership, Messrs. Fred. J. Locke, Wm. A. Galpin and M. G. Brown, who were duly elected.

The report of the committee on constitution was called for, when it became known that there would be a majority and minority report. The former was accordingly read by Mr. Davies, and the latter by Mr. C. G. Force. Following the reading Mr. Force spoke in favor of the minority report. Remarks in favor of the majority report were also made by Messrs. Davies and Latimer. After considerable debate as to what should be done with the reports both were received and laid over for two weeks, when it is proposed to make a constitution from the two. On motion, adjourned.

REGULAR MEETING,

February 4th, 1880.

In the absence of the President and Vice President, Mr. Charles Latimer was elected Chairman *pro tem*. The Rev. Dr. Bolles offered prayer.

The minutes of the last meeting were read by the Secretary, Mr. C. G. Force, and approved.

The following were admitted to membership: Messrs. B. Saunders, A. J. Horth, C. Kilxie, J. M. Carrington, M. H. Shay, George W. Gardner, J. W. Walton, C. G. Brunette, A. H. Delamater, J. A. Westbrook, John Coon, Joseph Orland, E. Reeve, Frank Wilson, T. Dunham, C. A. Otis, George T. McIntosh, W. F. Walworth, Nelson Moses and J. B. Davis.

The Secretary read the following letter:

YOUNG MEN'S REPUBLICAN LEAGUE, }
CLEVELAND, January 20, 1880. }

C. G. FORCE, ESQ., Secretary Anti-Metric Association, Dear Sir—
At a meeting of the Executive Committee this evening, by a resolution the rooms of the League were tendered to your association at a rental of \$3 per night.

Yours Respectfully,

M. M. HOBART, Secretary.

The letter was referred to the Committee on Rooms.

Mr. Wainright moved the adoption of the majority report on constitution as read at the last meeting.

Mr. M. E. Rawson wanted the several articles of the report read separately.

M. Force objected to the report for several reasons, the principal ones being a desire of independence from any other society and the vague language used in the report in objecting to the French metric system.

Mr. Wainright thought the society should not become a little one-horse concern by cutting loose from the Boston society, there should be a head somewhere.

Mr. Force thought that in this instance the head itself was wrong by dragging in the divinity of our old measure.

Mr. E. Rodgers spoke at length upon the subject. He could not vote for the majority report, he said, as it now stands. Although he was loth to act independently of the mother society, still even that society might be wrong in some instances. He objected to pledging himself to any constitution whose articles are unamendable.

Mr. Shongo wanted to know what the constitution of the Boston society has to do with the Cleveland branch? Suppose the Bostonians had voted themselves as an unamendable constitution, did that compel the Clevelanders to follow suit?

Mr. Latimer requested Mr. Davies to act as chairman and took the floor. He thought that the slim attendance of members was due to their fear that he would force them to adopt something they did not care about. Far from that; nothing was further from him; he never had a single selfish thought in the whole matter, and it hurt him deeply to be addressed, personally, when he was devoting his time and attention to this question. He was quite sure that no enterprise could successfully work without God's help. How would it look if some of the members were to go home and tell their wives they could not vote for the majority report, "because God is in it." The days have passed when people can carry God on one shoulder and the devil upon the other. If there existed any fear as to the possible misappropriation of the money to the Boston society, he himself would be responsible for it. And as to the absurd idea of some members that he was taking so much interest in the affair for self-aggrandizement only, that was wholly false and groundless.

Mr. Wainright called for a vote on the majority report.

Mr. Latimer having taken the chair, the question was put and carried by a large majority of those present.

The following was then declared as the

CONSTITUTION OF THE OHIO AUXILIARY SOCIETY.

A just weight and balance are the Lords; all the weights of the bag are his work. Prov. XVI. II.

CONSTITUTION.

of the Ohio Auxiliary Society for preserving and perfecting weights and measures. In co-operation with the International Institute.

ARTICLE I.—NAME.

This Association shall be known as the Ohio Auxiliary Society of the International Institute for Preserving and Perfecting Weights and Measures, and opposition to the French Metric System.

ARTICLE II.—OFFICERS.

The officers of this Society shall be a President, Vice President, Corresponding and Recording Secretaries, Treasurer and three Trustees, who with the officers above named shall constitute an Executive Committee.

ARTICLE III.—DUTIES OF OFFICERS.

SEC. 1. The President shall fulfill the duties of presiding officer, and in his absence the Vice President shall preside.

SEC. 2. The Recording Secretary shall have charge of all the records, books and business of the Association, keep a record of all its meetings and all matters pertaining to its affairs.

SEC. 3. The Corresponding Secretary, shall have charge of all the correspondence of the society.

SEC. 4. The Treasurer shall have charge of the financial affairs of the Society, collect membership dues, donations, etc., and pay out the same on order signed by the President and Recording Secretary.

ARTICLE IV.—MEMBERSHIP.

Any approved person may become a member on paying the fee according to the constitution of the International Institute, \$2 per annum, \$1 being retained by the Society and \$1 toward the expense of the Institute.

ARTICLE V.

This Society may adopt such by-laws as it shall prefer for its own government, provided they shall be in harmony with the Constitution and work of the International Institute, and with this Constitution.

ARTICLE VI—AMENDMENTS.

This constitution may be altered and amended by a vote of the members of the Society, at any regular meeting called for that purpose, but no alterations or amendments shall be made which are not in accord with the work and Constitution of the International Institute.

ARTICLE VII—BUSINESS MEETING.

The order of business at all regular business meetings of this Society, shall be as follows, unless otherwise voted :

Reading of minutes of the last meeting.

Election of members and officers.

Reports of officers and committees.

Other business.

ARTICLE VIII—ANNUAL MEETING.

The annual meeting of the Society shall be held on the 8th of November, unless it falls on Sunday, in each year, at which time the election of officers and trustees shall take place. In the event of the 8th falling on Sunday the election and annual meeting shall be held the following day.

After the vote on the constitution was declared, confirming the name and objects of the Society, the Secretary Mr. Force presented a paper addressed to the "Anti-Metric Society" which he wished to read. Objection was made to its introduction as not being addressed to the Society. After some discussion by Messrs. Rawson, Force, Wainright and others, on motion the communication was not received.

Adjourned to Wednesday evening, Feb. 18th.

REGULAR MEETING,

Feb. 18th, 1880.

In the absence of the President and Vice President, Mr. Charles Latimer was elected President *pro tem*. The Chairman opened the meeting with prayer. The minutes of the last meeting were read by the Secretary.

Owing to some irrelevant matter having been entered upon the minutes by the Secretary, Mr. Wainright objected to the same, when a discussion arose on the matter which ended by the striking out the irrelevant matter.

Mr. C. M. Reed was named for membership and on motion duly elected.

The report of the Committee on Stationery, submitting a design for letter heading, etc., was approved.

At this point of the proceedings, Mr. Force arose and stated that as a misunderstanding existed between himself and the Society he desired to offer his resignation as Secretary and named Mr. John Wainwright as his successor. Mr. Wainwright said that it would be impossible for him to serve in that capacity, as business obliges him to frequently absent himself from the meeting, he moved that the resignation of Mr. Force be accepted and Mr. George C. Davies elected as Secretary. Both motions prevailed unanimously, and Mr. Davies will assume the duties of his new office at the next meeting.

The chairman read a memorial prepared by the American Metrological Society petitioning Congress for the introduction of the French metric system in the departments of the government and in favor of making its use obligatory upon the people.

The Chair then read a memorial to the Senate and House of Representatives of the United States from the members of the International Institution for Preserving Weights and Measures, which is as follows:

That our present standard of weights and measures have been handed down to us from the remotest ages to the present time, and are interwoven in our very life and being, and all that we possess in and upon earth. That we view with alarm and apprehension the efforts being made by the American Metrological Society and others to utterly overturn these ancient standards of our race and substitute others of a foreign tongue and of a recent invention, viz: the French metric system constructed upon a false basis, all under the guise and pretence of introducing a simple metric or decimal system, thus not only attempting to deceive your honorable bodies, but deceiving the whole land. That, in pursuance of these schemes, under this guise a number of societies as a body have seemingly been petitioning Congress to make the use of the French metric system compulsory in certain departments, whilst it is believed that only a few of the members of these societies have voted for such a measure. That the French system has been made compulsory since its rise during the French revolution of 1792 in France and other despotic Governments of Europe, in Brazil, and some few other countries, but not in Russia or England, and it is now urged that this country shall adopt this French system, in order that it may be like the surrounding Kingdoms. That, whereas, in these kingdoms, the use of the French system is commanded by all the power of the government, that no man may buy or sell except by it, yet the people have not been made to do so universally, and whilst in England and this country its use has been made legal, in the former the very study of the system is being rooted out of the public schools, and in this country the people are almost universally ignorant of the passage of the law, and whilst from without, by the monarchical nations, and within this country by their followers a great pressure is brought to bear to force these measures upon this people; yet the people do not want them, and a number of societies are formed, and many now forming in the various states to resist the introduction of these new measures and to investigate the whole sub-

ject and simplify our own hereditary measures and weights; that the compulsory adoption of the French metric system by the Government in any department would be a grievous wrong to the people of this country, would produce the most disastrous consequences and interminable confusion and strife, already being felt in the measure of the coast survey, where the French meter is used; that no legislation upon this subject tending to an overthrow of our standards of weights and measures, should be made, and that any further legislation upon this subject looking to making this foreign system compulsory in any way without the joint action of Great Britain, with whom our business relations are of paramount importance, would be unwise; therefore your memorialists respectfully pray you that no further legislation on the introduction of the French metric system into any of the departments or by the people be enacted.

The latter document was signed by the majority of those present.

The Chair also read a letter from Mr. W. W. Evans, a prominent member of the Institution of Civil Engineers of England; of the American Society of Civil Engineers, and also of the Council of American Geographical Society, strongly favoring the continuance of the system of weights and measures now in general use in this country, and equally strong in denouncing the introduction of the French metric system.

Mr. Davies was called to the chair and Mr. Charles Latimer proceeded to read the following paper on the pyramid as a standard for weights and measures, which evinces very careful preparation and a thorough knowledge of the subject matter.

THE BRITISH INCH.

PAPER READ BY MR. CHARLES LATIMER BEFORE THE OHIO AUXILIARY
SOCIETY, FEBRUARY 18TH, 1880. 1837-87

If we seek for the most important unit of our measure, the one having the most precious value to us, I unhesitatingly say that we find it in the inch. What is this inch? Whence its derivation? What is its age? Did our British ancestors coin it and construct it from three barley corns? This cannot be for Dr. Kelly gives in his universal Cambest, a list of thirty-seven different inches, existing in as many countries and cities, ranging from 950-1000 of a British inch to one inch and 82-1000, averaging as near as possible the true British inch, and many of them called thumb and are just the model of the thumb. It is plain that these could not have been derived from three barley corns, which some flippantly assert as a base for the origin of our measure, for this measure exists in most parts of the world, from India to America. The word is from the Gaelic inn-is, and means island, and Webster gives it as meaning ounce from the Latin uncia, the twelfth part; and the word yunce is, by the same authority, in French, once; Italian oncia; Spanish, onza; Latin, uncia, a twelfth part of a pound and of a foot; also is given thus, the twelfth part of a pound troy, the sixteenth of a pound avoirdupois. There are other meanings of the word inch which are too deep for the present discussion, but be assured that it has an other very important and essential meaning. It certainly is the most remarkable unit in the world, and probably is the oldest and most useful. You all remember the ex

pression, "Give an inch and he'll take an ell." Now what is an ell? It is from cloth measure. What is its origin? This measure is doubtless as old as an inch, and has a very particular and special signification.

It no doubt is found in hundreds of cities, and I have a list of sixty-three, comprising many nations, Eastern and Western, and the average of the whole will not vary one-tenth of an inch from twenty five inches. In some it is exactly twenty-five. In many countries it is called braccio, which means arm, and it is just the length of an ordinary man's arm, and is the length, within a few hundredths of the measure which Sir Isaac Newton has calculated for the sacred cubit of Israel in British inches, and it is a very close approximation, twenty-five thousandths, of what Professor Smyth, the Astronomer Royal, has established as the sacred measure of the Great Pyramid of Ghizeh, viz: 25.025 British inches, or as he makes it, the pyramid or sacred inch differs from and is greater than the British inch one-thousandth. Now Michaelis, a learned Hebrew, speaks of this sacred measure as the ell. He says, "although Moses constituted the sacred tribe the guardians of the sacred standards and imposes on them the duty of acquiring a knowledge of weight and measures with mathematical accuracy, yet of things in which all were then interested he made no priestly mystery but placed certain models of them in the view of all, besides describing these in the books which were put into the hands of the whole people, etc. It must be remembered that Moses lived over 600 years after the Pyramid was built, and then it was a sealed book unopened. Michaelis says that the measures of the Tabernacle were given in ells, and the Ark in ells, and then these same measures were transferred to the Temple, it being sixty ells long and twenty broad and thus he says that the Mosaic ell was preserved. It must be remembered that Moses wrote 600 years after the Great Pyramid was built and was sealed up and remained sealed up until Anno Domini 840. Now what if we find the wonderful Mosaic ell in the Pyramid itself? But Moses used other measures besides the sacred ell, and we shall also find that the architect of the Great Pyramid used other measures besides the sacred ell in its construction.

But what if it be found that our own British inch and yard and foot were also used there—and not only so, but that the Nilometer cubit, the Turin cubit, the Roman foot, all used and correlated with the sacred or Hebrew measures, used there before Moses was born, just at the time Abraham was born—such is doubtless the fact, and it only requires your careful attention and a little study, with the knowledge of only the same rule of addition, subtraction and division to understand. Do not for a moment consider that this information is reserved for the wise and the learned. It is for you, for me, for the poor, for the rich, for every man, woman and child, and its contemplation and study will lead you to a better knowledge of Jehovah, and bring you into the knowledge of the light which that wonderful pile of masonry has concealed for the past 4000 years, to be revealed now, at this time to overthrow the machinations of men who are determined to rob us of our birthright; and a proper use of this pillar by us will crush them. It is our duty to study it, to understand it. Our seal teaches us that it is so—that seal which has never been cut until now, never been understood nor presented to the people, teaches us to look to the pyramid for our weights and measures. Do not let us be deterred by anything or person, by ridicule or persuasion, from doing so. It is our bounden duty, our paramount duty, and besides it is a blessed privilege to you, to us, the children of that seal, that we may come to a knowledge of its marvelous light.

What is the Turin cubit? It is a measure which has been found to contain between twenty and twenty-one British inches, and by Sir Isaac Newton to be 1.717 feet. What is the Nilometer cubit? It has been found by Rawlingson to be 1.71875 feet, a little greater than the Turin cubit. And what the Roman foot? This has been found to be 11.664 inches.

Now, all of these measures undoubtedly appear in the Great Pyramid. It is not my purpose this evening to proceed farther with the presentation of this kind of data, but to make a beginning by a blackboard illustration of some of the foundation A B C principles of the Great Pyramid structure, so that all may comprehend as I proceed how our measures are discovered therein. Much has been said about my attempt to subvert our measures and take the Great

Pyramid inch. I have the most profound admiration and respect in, and affection for Piazzi Smyth, the Astronomer Royal of Scotland, the great measurer, and acknowledge the wonderful results obtained by the use of the sacred cubit, the prophetic measure, and I doubt not that he will be as averse as any of us to disturbing our own inch an iota if it may be found intact in the stone monument. If the results obtained by another seeker after truth are correct, which I must say I have no reason to doubt, then the British inch is in the Great Pyramid. Of the truth or falsity of this you shall soon be enabled yourselves to judge.

We have been so accustomed to our weights and measures, as household words, that it has never occurred to us to dig for their origin, nor to ascertain what relation they have to nature. Thomas Jefferson, Secretary of State, was called upon by Congress in 1796 to make a report upon a proper plan or plans, for establishing uniformity in the currency, weights and measures of the United States, and on July 4th, 1796, sent it to the Speaker of the House of Representatives. It is an able paper.* At this time I will not quote it upon the methods, but upon the extraordinary proofs of a law of construction of our measures he found to his own surprise. He says the pound Troy contains 5,760, grains of which 7,000 are required to make the pound of avoirdupois. Of course the weight of the pound Troy is to that of the pound avoirdupois as 5,760 to 7,000, or as 144 to 175. It is remarkable he says, that this is exactly the proportion of the ancient liquid gallon of Guild Hall of 224 cubic inches to the corn gallon of 272, for 224 is to 272 as or 144 to 175. It is further remarkable still that this is also the exact proportion between the specific weight of any measure of wheat and of the same measure of water. For the statute bushel is of 64 pounds of wheat. Now as 144 to 175 so are 64 pounds to 77.7 pounds. But 77.7 pounds is known to be the weight of 2150.4 cubic inches of pure water, which is exactly the contents of the Winchester bushel as declared by the statute. That statute determined the bushel to be a cylinder $28\frac{1}{2}$ inches diameter and 8 inches deep. Such a cylinder as nearly as can be cubed and expressed in figures, contains 2150.425 cubic inches, a result which reflects authority on the declaration of Parliament and induces a

*This valuable paper will be found in the appendix herewith.

favorable opinion of the care with which they investigated the contents of the ancient, and also a belief that there might exist evidence of it at that day, unknown to the committees of 1758 and 1759. We find then in a continued proportion 64 to 77.7. 224 to 272, and as 144 to 175, that is to say, the specific weight of a measure of wheat to that of the same measure of water, as the cubic contents of a wet gallon to those of a dry, and as the weight of a pound Troy to that of a pound Avoirdupois. This seems to have been so combined as to render it indifferent whether a thing were dealt out by weight or measure, for the dry gallon of wheat and the liquid one of wine were of the same weight, and the Avoirdupois pound of wheat and the Troy pound of wine were of the same measure. Water and the vinous liquors which enter most into commerce, are so nearly of a weight that the difference would be neglected by both the buyer and seller, some of the wines being a little heavier and some a little lighter than water—another remarkable correspondence between weights and solid measure: for 1,000 ounces Avoirdupois of pure water fill a cubic foot with mathematical exactness. What circumstances of the times or purposes of barter or commerce called for this combination of weights and measures with the subjects to be exchanged or purchased are not now to be ascertained. But a triple set of exact proportionals representing weights, measures and things to be weighed and measured, and a relation so integral between weights and solid measures, must have been the result of design and scientific calculation, and not a mere coincidence of hazard. But the harmony here developed in the system of weights and measures, of which the avoirdupois makes an essential member, corroborated by a general use from very high antiquity of that, or of a nearly similar weight under another name, seem stronger proof that this is legal weight than the mere silence of the written laws is contrary, etc. Now you see that there is a deep source of these measures, and the wisest have not yet been able to fathom them. When I say wisest I mean the merely scientific. But there is a wisdom somewhere which shows these sources. Let it be our duty to investigate, study, develope and demonstrate their wonderful, nay Divine nature.

Now, if it be found that even to go back only to the date and construction of the Great Pyramid we can find all of these secrets of the construction of our weights and measures, what a grand consumation! But what next arises, how did they come to be in the Great Pyramid? Leaving that question for future steps, let us take up a few problems of this wonderful stone, that we may understand, the a b c and then we can build on and mount upward step by step, and I feel sure we shall have our reward in the investigation.

First, then, the Great Pyramid is a structure whose basis is thirteen acres larger than the Public Square—has equal base sides—and rises to height of 5819 British inches above the pavement—484½ feet. Its sides are 9168 inches, or 764 feet by Colonel Vise's measuring. Its height is twice the base, which is proportion of diameter to circumference, or the squaring of the circle.

I commend to your earnest attention the works of Piazzzi Smyth, "Life and Work" and "Our Inheritance in the Great Pyramid." To the discovery of the new relation of the British inch to the measures of the Great Pyramid and for other most marvelous relations referable thereto, I am deeply indebted to the work of J. Ralston Skinner, of Cincinnati, of which more hereafter.

Having concluded reading his valuable paper, Mr. Latimer suggested that the society established a library, and to encourage the proposition presented the organization with a number of valuable volumes on the subject of weights and measures. The books were accepted and the thanks of the society returned to the donor. An adjournment was then had until Wednesday evening, March 3d, at 7:30 o'clock.

REGULAR MEETING,

March 3d, 1880.

In the absence of the President, Mr. Latimer was called to the chair. Mr. Geo. C. Davies taking his place as Secretary.

After prayer by the chairman the Committee on Rooms reported progress and asked for further time, which was granted.

Mr. F. Rosenberg was admitted to membership.

Mr. Latimer stated that he had been notified by Piazzzi Smyth, that he had sent him from the royal observatory at Edinburgh through the Smithsonian Institute, a porcelain scale of the sacred cubit, twenty-five inches, showing the comparison of the British inch with the pyramid inch. Mr. Latimer said also that Walton Evans, a famous engineer of New York, who had had twenty-five years experience with the French metric system, had given it as his deliberate opinion that it is not as convenient or practical as the United States standard. Mr. Latimer offered to give \$25 toward forming a nucleus of a library for the society.

The following was read then by the author :

SELLING BY THE POUND.

BY GEO. C. DAVIES.

It is quite apparent that among the scientific and educated portion of the people of the United States, there is an evident desire for improvement in our system of weights and measures. Whether this is to be accomplished by the introduction of a new system, or by improvements in that now in use, authorities differ. For my part I am strongly of the conviction that no new system can ever be practically introduced. In support of this, I might point to the fact that reformers encounter no more formidable obstacles to progress than that sort of conservatism—if I may so term it—that prompts mankind to hold fast to the old customs and usages of society, no matter how inconvenient. A new system may be earnestly advocated by some of the learned or educated classes of society, but it is quite certain that the great body of active traders, farmers and operatives, constituting the great masses and forming perhaps nine-tenths of the population, could not be brought to a new system, however simple or strongly recommended, though it is possible by judicious manipulation they might be brought to adopt improvements in the old. If this be true, as doubtless it will be found to be, any improvement in weights and measures, particularly in the method of determining the *quantity* of commodities daily bought and sold must come from modifications

of our own well known system, which to say the least of it, is as old as our language.

We may not be out of place in this connection to quote the opinion of an English parliamentary committee in 1818, at the head of which was Sir David Banks, and among the members were Doctor Wallaston, Dr. Young, Capt. Kater, and other well known scientists. In referring to the subject of a change of system in England, the committee said:

"It is scarcely possible that the departure from a standard, once universally established in a great country, should not produce much more labor and inconvenience in its internal relations than it could ever be expected to save in the operations of foreign commerce and correspondence, which always are, and always must be conducted by persons to whom the difficulty of calculation is comparatively inconsiderable, and who are also remunerated for their trouble, either by the profits of their commercial concerns or by the credit of their scientific acquirements.

This is to the point and needs no comment.

It may also be proper at this point to venture the opinion that the French metric system which the American Metric Bureau and others are making such desperate efforts to force upon the people of this country, in its application to the affairs of every-day life, is in no respect superior to the methods in use in this country. If it be, I shall be greatly obliged to the advocates of that system to point out its advantages in buying, selling or shipping, over our system, when that is divested of its superfluous terms and double standards.

With the sentiments above expressed, the advocates of the metric system will doubtless disagree. Mr. Wigglesworth, in the bulletin of the American Metric Bureau, says: "We need a benevolent despot who would compel the use of the metric system after a fixed day. After a week no one would have any more trouble; after a month people would wonder how they could have used anything else, the labor of learning is so slight, the gain immense."

The same writer in the same article also says: "All druggists must be prepared to fill such prescriptions, for the metric system has

been legalized in the United States already, and the law compels them. All that is needed is for them to buy the weights, and that for a mere trifle." "Distrust, as ignorant every druggist not prepared to fill such prescriptions: Nor will you ever be compelled, or even willing to go back to use the old system."

This is the *theory* for its introduction by it advocates. Now let us see some of the results of practice. After an extended inquiry among the druggists in Philadelphia, the *Medical and Surgical Reporter*, good authority, says: "The introduction of the metric system, so far as Philadelphia is concerned, is an absolute failure. There are many reasons for this and good ones. When closely examined there is, by no means that simplicity about the metric system; nor is there that fixity about it which its advocates have claimed. Its unit is notoriously based on a mathematical blunder. The meter not being the ten millionth part of a quadrant of the Meridian of Paris as was supposed by those who first adopted it. It is wrong, one meter in 555-000. Practically it is found very inconvenient to convert accurately apothecaries into metric weights and measures." From this practical showing of the poor success of the metric system among the famous druggists and pharmacists of Philadelphia, it is quite evident that the theories of the metromaniacs is *slightly* at variance with practical results.

It might not be out of place at this point to inquire: What is the great necessity for the introduction of a new system of weights and measures? Is the cause of honesty and just dealing to be advanced by it? If not, why the pressing necessity of its adoption by our people? It will probably be found that this whole movement emanates from a morbid sentiment in the minds of certain *diligenti* that to use a genuine Yankeeism "hankers" after change—change whether wanted or not—change for the sake of change. But this change of the introduction of a new system involves what the advocates of the new system has not considered, or if considered they are silent about, namely, the necessity of maintaining and learning *two* systems instead of one. All the tables of units, divisions and multiples of the metric system that I have seen are accompanied by equivalents in our much abused system, thus showing the necessity of an acquaintance with both.

Now it seems to me that it is much more philosophic, much simpler and more in accord with the spirit of the age that instead of making the confusion which now reigns in our weights and measures, "worse confounded" by the introduction of a new one quite as complex as that it seeks to displace to turn our attention to improving the old without regard to the new.

In a paper read before this Society a few weeks ago, I showed how our system of weights and measures could be greatly improved by striking out redundant terms and double standards, bringing the whole down to a few simple units with their subdivisions and multiples. I now propose to show the practical application of some of the suggestions then made.

In the paper referred to, it was proposed to abolish all measures of capacity such as the gallon, bushel, &c., and their subdivisions, and sell and buy all articles now sold by measure, whether liquid or dry by avoirdupois weight, and to simplify that weight by reducing it to a few simple terms—say, grain, ounce, pound, cental or 100 pounds, and the ton of 2000 pounds.

This at first sight may appear like a very radical and startling proposition. But I believe it is not new, the custom of weighing all commodities of traffic outdating by many centuries the practice of measuring. We are told that the custom was universal in Babylon in its earlier and happier days. But in time certain sects of philosophers, college professors and other of like class got tired of the old order of things, set to work building a vast tower whose summit should reach heaven, from which the *dilutanti* aforesaid might scale the celestial battlements without submitting to the mortification of obeying the laws to which ordinary humanity must submit. At the same time others of the same sect were busy overturning old usages and customs, introducing changes in modes of conducting business, vaunting themselves as the only wise ones, able and ready to do anything their pride and ambition might prompt, when lo! the edict—"Go to, let us go down and confound their languages" went forth, and "the Lord scattered them abroad from thence upon the face of all the earth." Doubtless from this confusion of tongues and the diffusion of the Babylonian philosophers, we may date the confusion that has fallen among our

weights and measures. Some of my learned biblical hearers may not agree with me in this; but it is quite certain that since the Babylonian customs of weighing liquors was common, the systems of weights and measures of the world have become greatly confused, though we are told by that reliable historian Diedrich Knickerbocker, that for a short period in the early history of Manhattan that a Dutchman's hand placed in the scale was regarded as a pound, and his foot two pounds, in all traffic with the simple minded aboriginals. But to our subject.

The advantages of this method for determining quantities may be summed up as follows:

- 1st.—Simplicity.
- 2d.—Accuracy.
- 3d.—Prevention of Fraud.
- 4th.—Facility of application.

First—Simplicity. This will be apparent to any one on a moment's reflection, for nothing can be more simple than to place any vessel containing liquids, seeds or grain upon a suitable scale or balance and ascertain its weight, the weight of the package having been previously determined. Should the practice of weighing liquids become general, all packages intended to contain liquids could be weighed and branded before hand by an authorized weigher. The tare could then always be ascertained by inspection. Of course the value of a pound of whiskey, wine, oil, seed, grain, &c., could as readily be determined as that of a gallon or bushel of such articles. In the matter of grain, seed, &c., all are now weighed, and all the change necessary would be to discontinue the present absurd custom of putting the pounds into bushels and adopting a price per pound instead. Nothing could be simpler.

In the matter of accuracy, weighing will be found infinitely more accurate. Measures, of necessity must be made to contain the exact number of cubic inches required for a gallon, quart, bushel, &c.—no more—no less. In measuring liquids it is impossible, without waste, to fill the measure to its full capacity, consequently the purchaser is the loser to the extent of such deficiency on every gallon or quart he may buy by measure. With many persons and on certain kinds of liquors often a matter of considerable moment, besides this the difficulty of

making measures of the exact capacity required is great, much greater than is generally supposed. Besides this the constant liability of all measures made of copper, tin and other sheet metal to get bruised or bent, whereby their capacity is always diminished, never increased. Were a committee of engineers and mathematicians to be sent out by this association to measure and gauge the measures of capacity in use in Cleveland, I think I hazard nothing in saying that they would hardly find one in ten entirely accurate, while many would be found wonderfully wide of the exact dimensions. This is by no means the fault of the users of such measures, but arises from the difficulties of the case. So fully aware were the committee of scientists who devised the present English Imperial Standard, of the difficulties in the way of constituting exact measures of capacity, that after many unsuccessful attempts to procure a standard measure, they resorted to the expedient of taking a vessel holding exactly ten pounds avoirdupois of water at the temperature of 61° degrees as the standard Imperial gallon. The United States wine gallon is smaller than this and contains only 58.373 grains Troy, or 8.339 pounds avoirdupois of distilled water at the temperature of its maximum density $39^{\circ}83'$, the barometer at 30 inches.

In determining the contents of barrels, casks, kegs, &c., by the usual methods of gauge-rods, the operation in ordinary hands, is but little better than guessing, while such packages may be constructed to contain much more than a gauge-rod can possibly show. It is something to be wondered at that the United States government will continue so absurd a system of measurements. It, however, only follows in the footsteps of its illustrious progenitor England. Should the Internal Revenue department adopt the system of weighing spirits, a large army of gaugers could be dispensed with, and the expenses of the department greatly lessened. It might be added parenthetically, that should the noble army of whiskey and beer drinkers deposit at the time in the government coffers an amount equal to what they pay for each drink, in less than two years the amount so deposited would pay off the National debt, and in an other two years they would get it all back again and more too in the reduced cost of drinks.

As to preventing fraud by weighing instead of measuring, there should be no two opinions. Any one who has stood by a huckster's

stand and noticed the adroit manner in which he measures his thumb as he scoops into the measure his berries at thirty or forty cents per quart, will have no hesitation on this point, neither will the man who buys a gallon of whiskey, molasses or milk, if he takes pains to measure his purchase on reaching home. When we come to articles sold by heaped measures, such as potatoes turnips, apples, &c., it will be found that high prices are apt to make a great a difference in the quantity one gets for his money. Even in articles sold by the dozen, dishonest men readily find means to realize more for their commodities than they are entitled. It is not difficult to select the smaller apples, potatoes, &c., for one class of customers and pick out the large eggs for family use and sell the smaller ones to customers. As I write, however, I notice that petitions are now before the Legislature of Ohio, asking for a law requiring that eggs be sold by the pound, instead of by count, as now. This is a step in the right direction.

As to the facility of application of weighing over that of measuring but little need be said, for it is quite apparent that a vastly larger amount of any commodity can be weighed than can possibly be measured. Take for example a hundred barrels of whiskey. Any ordinary man who can read figures can accurately weigh them in less than an hour, while it would take more than that time to start the bungs, and get ready for the gaugers, who would consume several hours in guessing at the contents. And so on through all the operations of daily traffic.

One would, therefore, naturally suppose that this system of weighing, when once started would be speedily and universally adopted. But as the poet tells us

"Man never *is*, but always *to be* blest."

I suppose that generations will pass away before the custom becomes general even if adopted by the few.

If not trespassing too much upon your time, I should like to add briefly, tables of weights and measures as proposed in my former essay upon the subject and which might be properly termed the International System of Weights and Measures.

MEASURE OF DIMENSIONS.

10 inches	equal	one span.
12 inches	equal	one foot.
3 feet	"	one yard.
5280 feet	"	one mile.

To be used in all measures of extension.

WEIGHTS.

437½ grains	equal	one ounce.
700 grains	equal	1 onza.
10 onzas or 16 ounces or 7000 grains	equal	1 lb.
100 pounds	equal	1 cental.
20 centals or 2000 lbs.	equal	1 ton.

To be used in determining all quantities of commodities whether solid, fluid or dry.

LAND MEASURE.

144 square inches	equal	1 square foot
9 "	feet	" 1 " yard.
30½ "	yards	" 1 " rod, perch or pole.
160 "	rods	" 1 " acre.
640 "	acres	" 1 " mile.

It will be seen that in measures of dimension, only the terms inch, foot, yard and mile are retained. They are household words and perfectly "understood by the people," as the old English law has it. The inch and foot may be divided into tenths and hundredths and thus supply engineers, draughtsmen and others with a decimal system sufficient to determine any and all possible dimensions in the easiest and most simple manner, while the old terms foot, yard and mile remain for familiar and daily use. To this may be added the span or decimal foot of 10 inches.

In the matter of weights we retain only the grain, ounce, pound, cental or 100 pounds, and the net ton of 2000 pounds. The pound may be divided decimally, by the onza of 700 grains.

In land measure, which is all matter of record no change is recommended, except, to drop the superfluous terms.

On examination it may be found, I think, that these tables contain all the elements for determining the most complex question of

weights and measures, and what is more, they are Anglo-Saxon without a *cross*.

After a brief discussion of Mr. Davies' paper, Mr. Latimer read the following:

THE INTER-OCEANIC CANAL—IS IT TO BE A FRENCH OR AN AMERICAN MEASURE.

It may seem quite unimportant to some people whether the great inter-oceanic canal of the Isthmus of Panama be measured with a French meter or an American chain. For my part I think it is a matter of a great deal of importance. I say let it be measured with an American foot and inch and chain. Let it be platted and built with the same measure. I think it emphatically an American measure just as much as the Suez Canal is a European one and it should be built with measures which the people of this country and their children can understand and will not have to translate. Doubtless many will say what a narrow view this is! What does it matter what measure is used or whose money is used so that it is built? Well, this is a subject requiring consideration, and we are all interested in it, every man, woman and child; as we are in the preservation of our weights and measures, and you will note that curiously enough the International Constitution provides for the discussion of questions of national importance concerning trade and commerce, and the first one that springs up is one with which the French meter is intimately connected. It is a French measure with which we are confronted upon this continent, for it is proposed to build the canal under a French charter, and that means French measures. Now it must not be supposed that I have any prejudice against France or the French, against the land of a Lafayette, our old and faithful ally, at a direful crisis in the history of this country. With France as a fixed republic, sustained and surrounded by republics, with one flag above all, with standing armies no more to menace the peace of the world, what would it matter who built the canal. But the heart of Europe, inimical to our institutions, armed to the teeth, ready for a conflict soon to come, which is to try the vital powers of this republic, it is very important, indeed, vital to our interests who controls the canal. A canal under foreign

influence means a foreign flag upon these shores. A canal built under the domination of the monarchical powers of Europe and it ever remains such until the great questions of the dilemma be settled. The canal of the Isthmus of Panama would be the great gate of our country. England to-day possesses the gates of her enemies, but it will not do to let England, France or any other European nation possess our gates.

Suppose that the canal be built under a French charter, under French auspices, French measures—what would we have. We would see then the French flag floating, French men-of-war always on these waters, French engineers attending to the work, French employes along the whole route, in fact France and French influence transported to our doors, placed alongside of our work, the Panama railroad, and our people and race pushed aside by a foreign power and influence guarding the very gates of our inter-commerce, and paying tribute upon every ton of shipping to foreign interests instead of our own people. Suppose that the Suez canal had been built by American people and our nation had pushed their influence to control the gates of Europe, forcing them to pay tribute on every ton of passing ships, would their not have been a humiliation in it to England or France that they could never have broken. The possession of the canal is of more importance to us than the possession of the Suez canal is to England and see now how the influence of nations there is scanned and watched, and with what vital importance its possession and control is viewed.

The canal at the Isthmus is an American measure; and must be measured with American measures and held and controlled by American measures. We have had enough of the French meter already; its use is permissive; that is far enough. We do not want its use compulsory. We do not want to have our tonnage to pass through the American Canal and have to count the distance in kilometers, have the weights registered in kilogrammes and pay our tonnage dues in French francs. But such is the programme, gentlemen.

I have just returned from a visit to New York, where I went to attend an adjourned meeting of the American Society of Civil Engineers, which took place in the theater and rooms of the Union League

Club, on Thursday evening last, in Madison Square, New York, at which time the Count Ferdinand de Lesseps with his corps of engineers was present and were the guests of the Society, where M. de Lesseps made a full disclosure of his plans for building the great ship canal.

Monsieur de Lesseps is a noble specimen of a French gentleman, although his hair is snowy white and seventy-four winters have passed over him. He is as active, vigorous and quick as most men at fifty and withal of a ready wit, and eloquent tongue, an earnest and I should say, an unselfish spirit. That he is ambitious for the glory of France there is no doubt and yet seemingly working unusually in the interest of humanity, if I may judge from my short personal acquaintance. His mission was the result of a congress of engineers in Paris, called by himself, at which there were one hundred present. He was instructed to visit the Isthmus and examine the Panama route. That is the route where the Panama Railroad, built by American capital, is now located and operated.

He was only to examine the one route because it was supposed that it presented the only feasible spot for a through cut from ocean to ocean without tunnel or locks.

For many years, from time to time, surveys have been made by private and governmental parties seeking to find the most practical route for a canal across the Isthmus.

I became acquainted with this subject somewhat in 1854. Dr. Black a citizen of the United States, by dint of much perseverance that year, through the statements of Dr. Cullen and Lionel Gisborne, induced an expedition to be fitted out by Great Britain, France and the United States to make a survey across from Caledonia Bay, a splendid harbor on the Atlantic Sea to the Gulf of San Miguel, on the Pacific side, about forty miles across. Messrs. Gisborne and Cullen maintained that there was a very easy level route there.

The United States sent the Cyane, Captain Hollins in command with Lieutenant Strain in command of the surveying party for the survey. England and France sent each a ship. Our ship got to Caledonia Bay first and commenced an expedition. Fortunately I was taken

sick and I probably escaped the fate of many of the party of twenty-one of whom six starved to death. The remainder reached the Pacific nearly naked and starving. Soon after our arrival the French and English ships came, but no work was done with their co-operation by Captain Hollins. The French and English joined and proceeded up the mountain defile about five miles where they were overtaken by a second party of ours. I put out to meet Strain, and when Dr. Cullen and Mr. Gisborn were seen up a tree each maintaining that the route to the Pacific was in a different direction, but as nothing but mountains were on all sides, the French and English soon retired to their ships in disgust and returned to their native land and thus ended the San Miguel survey.

Subsequently the Atrato route was surveyed much farther south but it was very tortuous. Then was surveyed more particularly the Nicaragua route, a distance of eighty-one miles—to have locks. Then came the Tehuantepec route, one hundred and eighty-one miles across. Then the San Blas, thirty miles and finally the Chagres route, and it would seem that the whole subject lay between the selection of these two routes. Mons. de Lesseps and Mr. Dirks, the latter a Dutch engineer who built the Amsterdam canal, and Mons. Douzan, the present engineer of the Suez canal, gives the description of this survey of the Panama or Chagres river route. The route is forty-five miles long.

It is proposed by M. de Lesseps to make a through cut from ocean to ocean, having a guard lock on the Pacific side because the tide rises eighteen feet higher on that side than on the Atlantic. The average cutting upon the whole line is not more than eighty feet, the heaviest two hundred and seventy to three hundred feet and that for a very short distance, say one thousand two hundred feet. There are seven miles of heavy cutting averaging over one hundred and fifty feet. The total excavation is estimated at 100,000,000 of cubic yards, of which thirty-three per cent. is hard rock. The depth of the canal to be twenty-six feet at water line. The total cost to be \$168,000,000.

The estimated time required to complete, seven years. The lowest estimated amount of tonnage to pass through per annum, six millions of tons; the tariff to be three dollars per ton; the yearly in-

come \$18,000,000. M. de Lesseps say that he considers the difficulties of building the Panama Isthmus Canal as much less than that of the Suez Canal—better climate and more favorable in many respects. The great difficulty to overcome is the wonderful freshets of the Chagres river, which sometimes suddenly rise forty-feet. To provide for this it is proposed to construct a dam costing \$20,000,000. The height of this dam is to be sixty-five feet, and capable of holding one thousand millions of cubic metres of water.

This project of M. de Lesseps is for a salt water canal, so that vessels may sail from the ocean in broad day light without locks, except the guard lock on the Pacific side. Of course it must not be inferred that M. de Lesseps is the discoverer of this route. The attention of sagacious Americans has been upon this route and every other, before. Now to build this canal M de Lesseps proposes that half the stock shall be owned or taken in the United States and half in Europe, but if the United States people do not take the half then the deficiency will be made up in Europe. Mr. Cyrus Butler asked M. de Lesseps if he did not examine the San Blas route, surveyed and examined at the expense of Mr. Kelly, a patriotic citizen of New York; a route only thirty miles across, which would cost \$120,000,000, whilst the Panama route would cost \$168,000,000. He also asked if M. de Lesseps had made any move toward an arrangement with the Panama Railroad Company, to which M. de Lesseps replied that he was only directed to examine one route; that this was the feasible one—an open cut; that the seven miles of tunnel was an inseparable barrier to the San Blas route; that no tunnel should be used, and he therefore proposed to cut 300 feet on the Panama route rather than tunnel even a short distance—the latter part of the question was not answered. M. de Lesseps said that if in the building of this canal it had been proposed to use locks he should have put on his hat and left. Now the San Blas route, which is summarily rejected by M. de Lesseps without having seen it, simply because of its seven miles of tunnel, Walton W. Evans, one of the most distinguished engineers of the country, defends in the strongest terms and maintains that the floods of the Chagres and the slides will prove a far more insurmountable barrier than the tunnel of the San Blas route. He claims that this rock is strong, firm, and a tunnel

180 feet high and 80 feet wide can be cut in less time and use more men than the Chagres or Panama Line. However this may be, of the Atrato, the Darien, the Tehuantepec, the Nicaragua, the Panama or Chagres, and the San Blas, it seems conclusive that the whole matter is narrowed down to the two last. And the question then arises, shall the great canal be built by foreign capital entailing foreign influence, foreign charter? Shall it be built by our own people with domestic capital, with an American charter, or shall it be built by national capital alone, under the auspices of the government and that of the ownership of the land, together with the aid of other maritime nations, and be thrown open free to the world, a tax only being levied upon the nations using it, pro rata for the tonnage of each passing through it. If all the earth were under one flag, that of our mother Eve, and we were all as brethren dwelling together in unity, there would be but one answer and that would be to take the last plan. But as the controversy of nations has yet to be settled and as this continent is for America, the question is an American one first and must be treated as a question like the balance of power is in Europe.

I gather from conversation with M. de Lesseps that the Monroe doctrine, as it has been called, has nothing whatever to do with the canal. He did not desire to bring politics in but the question of the United States government applying that doctrine to the canal question is absurd, for we might as well say that England should not build a canal across her possessions or any of the South American Republics across theirs, and at first sight this appears plausible; but when we dig deep down into the motives of men and powers and principalities, we find these motives and plans deeply hostile to the peace and happiness of the Republic. Such was the deep laid plot of Napoleon in placing Maximilian upon the throne of Mexico. The following is the Monroe doctrine: "We owe it to candor and to the amicable relations existing between the United States and the European powers, to declare that we shall consider any attempt on their part to extend their system to any part of the hemisphere as dangerous to our peace and safety." Now, gentlemen, I said before in my pamphlet upon the battle of the

standards that whenever the grave diggers begin to measure our last resting places by the French metric system, then understand that the curse of the Almighty may crush it just as he did the impious attempt to abolish the Sabbath. And now I say that whenever the great Isthmus canal, the great gate of American commerce, and our inland trade is planned, measured, platted and built by the French metric system; when our own commerce pays tribute by its weight in kilometers, and its tolls in French francs to French agents, it settles all of the canal questions by French laws, by French charter. When the gates of our people in fact are possessed by a foreign nation, then know for certain that shame will cover the face of the American people and their graves will be dug by the French meter.

REGULAR MEETING,

March 17th, 1880.

In the absence of the President and Vice President, the meeting was called to order by the Secretary, and on motion Mr. Latimer was called to the chair, and on taking his seat, offered a brief prayer for heavenly guidance.

The minutes of the last meeting were approved.

The following persons were then named as members, who were on motion unanimously elected. L. H. Clark, T. D. Crocker, Chas. B. Lewis, S. H. Sprouls.

Mr. Adams from select committee made a supplementary verbal report in relation to rooms, and moved that the matter be referred to Executive Committee with power to act not only in engaging rooms, but in buying desk, book case, &c.

Mr. Rawson made verbal report as to funds in Treasury; members dues, &c.

Mr. Latimer made some remarks and suggestions in regard to the necessity for raising more funds to carry on the work of the Society.

Mr. Rawson suggested donations directly to the Society to pay current expenditures.

Mr. Latimer proposed a subscription for that purpose and named one hundred dollars as the amount he would give toward the general fund of the Society.

Mr. Claflin proposed that Executive Committee send out a subscription paper for that purpose.

Mr. Rawson moved to refer whole matter to Executive Committee with power to act. Carried.

The Secretary then read a letter from C. L. Lowthrop of Newark, N. J., on the subject of the French Metric System, to which he was earnestly opposed.

Also one from John B. Jervis, one of the oldest engineers in the United States, directed to the Secretary of the Metrological Society, giving his reasons for opposing the introduction of the Metric system into the United States.

Mr. J. Wainright then read the following:

THE GREAT PYRAMID, ITS LOCATION, ORIGIN AND CONSTRUCTION.

PAPER READ BEFORE THE AUXILIARY SOCIETY OF OHIO, FOR PRESERVING WEIGHTS AND MEASURES, CLEVELAND, OHIO, BY J. WAINRIGHT.—MARCH, 17TH, 1880.

In accordance with the request of some of the members of the Society at the last meeting, I will present to you this evening a few facts in regard to the Geographical position of the Great Pyramid of Ghizah, the date of its construction and a few of its general dimensions. To those who wish to study the matter more minutely, I would refer them to Prof. P. Smyth's "Life and Works" and "Our Inheritance" in the Great Pyramid by the same author, and a work by Dr. Fish of Chicago, on the Pyramids of Egypt, the Encyclopedias and various other works on the subject. To those who have not made the matter a subject of study or investigation, I hope that the few general facts I will give this evening may be of some interest as it certainly has been to me.

The Great Pyramid stands on the west bank of and at the apex of the Delta of the river Nile, about 10 miles from Cairo, 110 miles from the Mediterranean Coast, and about 100 miles west of the north end of the Suez or the south end of the Suez canal, and on the line between upper and central Egypt. Its latitude is about $29^{\circ} 57'$ east of Greenwich, and it is on the parallel of latitude and meridian of longitude, that the greatest area of land surface is found on the surface of the earth, so that its geographical position may be said to be in the center of the earth.

A curious fact discovered by a U. S. naval officer, is, that if the diagonals of the base of the Great Pyramid be extended northeast and northwest (the Pyramid itself standing due north and south) the diagonal to the northeast would strike Port Said, the north end of the Suez Canal, and the northwest diagonal the city of Alexandria both of these radii would be equal to about 110 miles, and if a circle is described with the center of the Pyramid as a center, and these radii it would include the whole coast of Egypt from Port Said to Alexandria. A distance of about 200 miles would be on the circumference of that circle, or so closely that no other circle would fit it so well.

To the south of and along the banks of the Nile for a distance of 50 miles or more, a large number of Pyramidal remains are found, the exterior of some of them being in a better state of preservation than the Great Pyramid, which being nearer to the city of Cairo, than some of the others has suffered more by the depredations made upon it for building materials, the whole of the outside casing stones being carried away. At the present time the great Pyramid stands at the head of all of its counterfeit brethren on the rocky plain or lower plateau of the Libyan range, and is about 150 feet above the level of the Nile, and overlooking the fertile valley of that river and its Deltas to the north.

In addition to being the largest, and it is also in its proportions and construction entirely different from the other so called Pyramids, which seem to have been built for and used as tombs. Neither on the outside or inside of the Great Pyramid has any inscription, sculpture or hieroglyphics been found to indicate that it was built for or used as

a tomb, all of which indications are found in the other or similar imitations of the Great Pyramid.

It is not noted especially for extensive size in single stones, but for its immensity as a mass, it being the largest structure of stone on the face of the earth to-day. It is also noted for its polished interior stone work, and joints of microscopic fineness and when we find such work enclosed in dark and narrow passages and embedded in tons and tons of masonry, it is certainly a cause of wonder, and the question arises: What was intended and how did they build it?

A great deal of doubt existed up to within the last decade as to when and who built the Great Pyramid, but from various astronomical calculations, and from the discovery in 1837, (by means of a forced excavation over the King's Chamber) of some mason's marks in a kind of a red paint on some of the stones above the roof of the King's Chamber which indicated that they were cut during the time of King Chofu or Cheops in the 4th Dynasty of the Egyptian kings. Authorities differ as to the date at which this King reigned, some say 4235 B. C., others 3124 B. C., and again 2170 B. C., this last date is confirmed by subsequent astronomical calculations which prove that the then North Star "A Draconis" shown directly down the descending passage way. Pyramid students also claim that the date of the erection of the structure is shown within itself by means of a graven line cut in the solid masonry of the descending passage way, 2170 B. C., which is now generally accepted as the date of its erection or about 4000 years ago.

It is built on a square foundation of about 764 feet to the side and rises to a height at the apex of 486 feet. It covers about 13 acres and contains about 7,000,000 tons of masonry,

The rock plain upon which the Pyramid stands seems to have been carefully leveled off and the corner stones set in a perfect square in sockets about 8 inches deep cut in the natural rock, the masonry, granite and lime stone was then laid up in courses from two to four feet, the courses numbering about 208, the outside casing stones of limestone were cut and beveled to fit the courses or possibly laid up rough and dressed to the batter.

The exterior faces of the Great Pyramid were highly polished and the joints so full that they were hard to distinguish with the naked eye, and it could be seen for miles showing like a jewel when touched by the rays of the sun. Strabo and Diodorus the earliest of Greek writers state that it was so immense in size and grand in appearance that it seemed as if it had descended from the heavens instead of being erected by the laborious toil of man.

The rough sketch which I show you will give you an idea of the proportions of the exterior of the structure, and its interior chambers and passage ways.

The entrance way to the interior of the Pyramid is by means of an opening on the north side of the Pyramid 53 feet above the base, and about 25 feet east of the center line of the same, so that a cross section of the Great Pyramid showing its passages and chambers, lies 25 feet east of the centre, the Pyramid itself standing due north and south. This opening is about $3\frac{1}{2}$ feet wide and four feet high, and is the entrance way or portal to the descending passage way which makes an angle of $26^{\circ} 41'$ with the base line of the Pyramid. The length of this descending passage way is 343.7 feet, then it runs horizontal for 25 feet and opens up into what is known as the subterranean chamber, a room 46 feet north and south, 27 feet east and west, and $11\frac{1}{2}$ feet high, the floor of which is 100 feet below the base of the Pyramid. To the south of this chamber a passage way of small dimensions extends for a distance of about 53 feet. About 96 feet down the descending passage from the entrance, the ascending passage way commences and ascends at an angle of $28^{\circ} 18'$ to the base of the Pyramid. The ascension to the interior of the Pyramid by means of this passage way is barricaded by an immense block of granite bonded into the roof, bottom and sides of the ascending passage way, which will be referred to hereafter. This ascending passage extends for a distance of 123.7 feet. Above it intersects the horizontal passage way to the Queen's chamber, which is situated on the 25th course of masonry. At the intersection of the ascending passage way and the horizontal passage way to the Queen's chamber is the mouth of the well, which is an irregular shaft built down through the masonry of the Pyramid and through the solid rock for 170 feet to the descending passage way,

which it intersects just before the descending passage way reaches the horizontal passage way leading to the subterranean chamber. The horizontal passage way to the Queen's chamber is 126.6 feet long, the Queen's chamber is 17 feet wide north and south, 19 feet long east and west and 20 feet high to the top of peaked ceiling. Coming back to the mouth of the well, and the junction of the ascending passage way with the horizontal passage to the Queen's chamber, it still continues to ascend at the same inclination through what is known as the Grand Gallery for a distance of 156.8 feet, its height being 28 feet, this brings us to the center or axial line of the Pyramid. North of the axial line and in the Grand Gallery is the great step 3 feet high and about 5 feet long from the axial line to the King's chamber, a distance of 22 feet. We pass through the ante-chamber and low passage way to the King's chamber which is 17 feet wide north and south, 34 feet long east and west and 20 feet high to the flat ceiling. This ceiling is composed of stones 27 feet long by 5 feet wide and $6\frac{1}{2}$ feet high and weighing about 73 tons apiece, and has 5 other smaller chambers over the first ceiling. The King's chamber is on the 50th course of masonry and from each side of the chamber north and south, air passages lead from a point near the floor of the chamber to the exterior north and south sides of the chamber. On the floor of the King's chamber is a coffer, a stone box 90 inches long, 39 inches wide and 41 inches high. This is the only piece of furniture found in the place. These measurements are of course only general as it has taken Prof. P. Smyth a long time, and three large volumes to give all the details.

When the Pyramid was completed the entrance way was sealed up, and it is very doubtful whether it was ever entered until about 820 A. D. or 3000 years after its erection.

Herodotus the Greek historian visited Egypt either at 445 or 448 B. C. and on his return described the great Pyramid. His description refers to the exterior, he does not state that he was inside of the structure or that any one else had been since its erection.

There was previous to 820 A. D. a legend among the Arabs that a moveable stone gave entrance to the Pyramid, but no one seems to have known of its location. When in 820 A. D., the Arab

Caliph Al Mamoun made a forced entry into the Pyramid, he did not know of the entrance by the descending passage way which is 53 feet above the base, but he commenced his excavation about 25 feet above the base and in the center of the north side. After working for weeks and months they had tunneled into the solid masonry about 100 or 110 feet or to a point opposite the intersection of the descending with the ascending passage way and on a level with it. They were about to give up the job in disgust, when they heard the sound of a stone falling in the masonry, to the left or east of them. They then started to tunnel in the direction of the sound and before long struck the descending passage at the junction with the ascending passage way and found that a stone had dropped out of the end of the ascending passage way and lay on the floor of the descending passage way. This stone was cut to fit in the end of the ascending passage way like a plug, so as to cover up the granite block referred to before as closing up the ascending passage way, and called the portcullis block. The pounding and blasting in the adjoining masonry having started and forced out the plug stone which they heard when it fell out. Finding the portcullis block too hard to cut through they tunneled around it in the limestone and come out into the ascending passage way behind it. They found the ascending passage way filled up with blocks of stone which they removed, this done, they spread themselves through the Grand Gallery, King and Queen's chambers, took a look at the mouth of the well at the north end of the Grand Gallery and departed, as they did not find the treasures they had been looking for, and which they did find in the smaller Pyramids.

After this attempt the Pyramid was not molested for a long time, and the forced passage way of the Caliph became filled up and covered over by the refuse material surrounding the Pyramid, caused by the tearing off of the outside or casing stones, and the secrets and legends of the Pyramid remained only in the traditions of the Arabs.

In 1637 A. D. Befesee Greaves an Englishman, made some researches and measurements of the Great Pyramid. In 1763 Mr. Davidson the British Consul at Algiers, spent considerable time in investigating the interior of the Pyramid, and made a forced passage way

from the top south-east corner of the Grand Gallery to the hidden chambers or cavities over the King's chamber. In 1799 the scientists under Napoleon made some measurements, and in 1817-18, Mr. Cavignia made further investigations and at great expense of time and money cleaned out the descending passage way, opened up the subterranean chamber, and ascended through the well to the Grand Gallery.

In 1837, General Howard Vyse commenced his investigations and developed many of the facts and measurements now known, and up to 1864 his reports contained the fullest information of any extant, he also made the excavation along the east side of the chambers over the King's chamber, opening up 4 chambers or cavities in addition to the one found by Davidson in 1763. In doing this work he discovered the marks in red paint on the backs or tops of the stones, which went to prove the date of the erection of the Pyramid, the marks being those used by King Chofo or Cheops. He also dug out the socket or corner stones at the base of the Pyramid and made new measurements of the base side of the structure.

Up to this time no one had noticed the remarkable mathematical and astronomical proportions of the structure, but in 1859, one John Taylor of London, wrote a work entitled the "Great Pyramid, why it was built and who built it," in which he first called attention to the wonderful fact of the Pyramids π proportions.

All will understand the factor π , equal to 3.14159 x or plainly that the diameter of any circle multiplied by this factor will give the circumference of the circle.

Archimedes asserted that the relation of the diameter to the circumference of the circle was nearly that of 1 to 3 10-71, using a polygon of 96 sides, but it was not until 1590 A. D. that Von Ceulon developed the established value of π .

Legender and Playfair afterwards developed the present method of obtaining the value as taught in the schools.

Taylor discovered that if a circle was described with a radius equal to the height of the Pyramid, the circumference of the circle would be equal to the sum of the four base sides of the Pyramid, this

remarkable proposition is not shown in any one of the smaller Pyramids, and it is not only carried out in its exterior but in all of its interior monuments, he also suggested some astronomical facts and calculations, and it was this work that caused Prof. P. Smyth, to go to Egypt in 1864-5 and make those wonderful measurements which appear in his written works and which are the basis for all Pyramid discussions since that date.

It would take more space and time than I can give to this matter to go into his minute measurements and the manner of making them, and the delicate instruments used by him, as he has devoted three large volumes to the matter.

I have not referred to any method or manner of constructing the Great Pyramid, no one seems to have taken the matter up, probably for the reason that one competent to judge of such work at the present time, might give as good an idea as his neighbor and still both of them be wrong. My own idea is that rollers, stone boats, heavy bars, and a large amount of raw laboring material were the chief factors in its erection.

The granite in the structure has been traced to a point about 500 miles up the river Nile. It was undoubtedly quarried and floated down the river on rafts, and unloaded on the banks of the river and hauled to the site of the Pyramid by cattle, as the remains of a large causeway still exists between the bank of the river and the Pyramid. The limestone in all probability came from the hills on the east side of the river, opposite the Pyramid. It is supposed that there are other chambers in the Pyramid yet undiscovered, this is confirmed by the chippings of certain kind of stone found at the base of the Pyramid amongst the refuse stuff, the original of which has not yet been found in any of the passages or rooms of the Pyramid.

Hoping that the members may obtain a general knowledge of the location and size of this wonderful structure, I shall be glad to answer any question if I have not been clearly understood-

Discussion then ensued in regard to some of the minor details, &c.

After the conclusion of Mr. Wainwright's paper, Mr. J. R. Skinner of Cincinnati, read an essay on the actual measures of the Great Pyramid of Egypt, in terms of the British inch, disclosing by its means the architectural system employed in its construction to accompany the sectional plan of the Pyramid, prepared by Mr. Charles Latimer.

NOTE.—This valuable paper is contained in the appendix to this volume.

At the conclusion of Mr. Skinner's address, a vote of thanks was unanimously tendered Messrs. Skinner and Wainwright for their able and instructive essays.

Mr. Latimer called attention to a very valuable porcelain scale of the sacred cubit, most accurately graduated in British and Pyramid inches. This scale was loaned by Prof. Piazza Smyth, Astronomer Royal of Scotland, to the Ohio Auxiliary Society for the use of its members.

Adjourned.

REGULAR MEETING,

March 31, 1880.

In the absence of the President, Mr. J. F. Holloway, Vice President, presided. The meeting was opened with prayer by Mr. Charles Latimer, after which the minutes of the previous meeting were read and approved.

Mr. Latimer from Executive committee made a report of the proceedings of that Committee to the effect that the Secretary be directed to purchase Desk and Book Case, not to exceed \$27.00, and \$10.00 worth of postal cards to print notices to members of meetings of the Society.

The Secretary was also directed to publish transactions of the Society at an expense not exceeding \$50.

The committee also accepted the proposition of the Young Men's League for the use of the Society, at a rent of \$3 per night for room, light, attendance, &c.

F. W. LePrevost, Thomas B. Reeves, C. E. Burke, F. B. Saumenig and Charles Moses were elected members of the Society.

Felix Rosenberg, stated it would be a good thing to have postal cards printed for notifying the members of the Society of meetings, and moved that 1,000 cards be printed for that purpose. The motion prevailed.

Mr. Latimer reported a subscription of \$200 towards the expenses of the society.

The Corresponding Secretary read a letter from J. R. Skinner, advising him of a donation of 200 copies of his late address for the use of the Society.

The Corresponding Secretary also called attention to a letter just received from Mr. J. E. Hilgard, United States Coast Survey, confirming a report of his to Congress, opposing the introduction of the French Metric System into this country.

Mr. Davies read a letter written by Charles Casey of Pollerton Castle, Carlow, Ireland, and published in the *Jamestown, N. Y., Journal*, relative to a letter written by W. C. J. Hall, of that place.

Mr. Charles Latimer gave the following interesting talk on "The Origin of the Sacred Cubit" after which the meeting adjourned for two weeks.

UPON CUBITS.

WHAT IS THE SACRED CUBIT?

AN ESSAY READ BY CHAS. LATIMER, BEFORE THE OHIO AUXILIARY SOCIETY AT CLEVELAND, MARCH, 31ST, 1880.

The subject is a hard one, but I cannot in a brief paper go over the whole ground. I shall not attempt it—wish to throw a little light upon it for the society.

The word cubit is from the Latin *Cubitus*, said to be forearm and of these cubits there are a great variety, but I shall only speak of three here—the Common—the Royal and the Sacred. It seems certain that these three classes did exist and are recognized, for which we have highest authority, among which is Sir Isaac Newton, who wrote a most valuable and dissertation on cubits. This paper was written in Latin and published in 1737.

These cubits were also classed as Common, the Turlin, the Nilometer or Memphian Cubit. Then the Sacred, also the Roman and Greek cubits said to be 18 of their respective inches long. The Roman inch being .972 of our foot.

On page 340 of "Life and Work" by Piazzi Smyth, many lengths are given, the mean of which is 20.73 inches. Now this is so remarkably near the Turin Cubit as given by J. Ralston Skinner on his source of measures, viz: 20.612 inches and so closely agrees with Sir Isaac Newton, Rawlingson and others, that the conviction is overwhelming to me that he is correct, therefore I am willing, unhesitatingly to accept 20.612 as the Turin Cubit.

The Nilometer cubit exceeded the Turin a very little, that Mr. Skinner shows, is found by the following proportion, 20.612: 6561: 648: 20.62647. Whatever may be said of the last it is a most marvelous number fitting perfect into nearly all of the British measures of the Great Pyramid and recognized as a number, and for ascertaining the Sun's horizontal parallax, Sun's distance—in fact an astronomical number. But because of the wonderful fitness of their numbers as measuring the Great Pyramid, let it not be supposed that there is no other cubit which will also unlock the secrets of the Great Pyramid.

Some have denied the existence of this Sacred cubit—The ground is untenable—the Sacred cubit does exist.

Sir Isaac Newton concludes that the Sacred Cubit is 25 6-10 unceas or inches of the Roman foot, and which at .972 of an inch to a foot would give the Sacred Cubit at 24.8832. John Taylor says that he thinks this is more nearly correct.

Piazzi Smyth the Astronomer Royal for Scotland, concludes that it is 25.025 British inches.

Sir Isaac Newton says that the proof of the length of the Sacred cubit comes from the Temple. He says that the Roman Cubit is to the Sacred Cubit as 2 to 3, and Josephus so put it in giving dimensions. For says he "Josephus writing to the Romans, everywhere puts three Roman cubits for about two Sacred cubits except in some of the most eminent dimensions of the Temple, properly so called and set down in scripture; in which case he thought proper to retain the Sacred cubit. This will appear by comparing the cubits of Josephus with the Sacred cubit of the Talmudists in the following table.

Now the Sacred cubit can have no reference to the forearm, which is not more than 15 inches in an ordinary arm of man. The full arm however is 25 inches, my own is exactly that length. this agrees with the term *Brazs* "Arm" of the Italians which is the *Ell* and the *Ell* is usually about 25 inches, and Michaelis calls the Sacred cubit the *Ell*.

I conclude that the said Sacred cubit is without doubt about 25 inches and is the *Ell*.

The following extract from the transactions of the Royal Society of London, will throw some light upon the subject of cubits.

THE LENGTH OF THE EGYPTIAN CUBIT.

The earnest labors and writings of Professor Smyth, Astronomer Royal of Scotland, have succeeded in drawing the attention to the importance of the accurate determination of the units of length, weight and volume that were in use in Egypt. There can at least be no doubt but that the measure in use by us in modern times, except, of course the French Metric System, are a direct inheritance from the the days of the early Egyptians; that, in fact, the measure used by the Hebrews were identical with those of Egypt. and that there is a remarkable similarity, even between the ancient measures of China, Assyria and Egypt. Although much has been written to controvert the position taken by Smyth in his remarkable work, "Our Inheritance in the Great Pyramid" yet there seems to be a general conversion to his views, or to views not materially different from his, if we may judge from the remarks of Sir Henry James on the Greek and Egyptian measures of length, recently published by the Royal Society, as prefatory to some elaborate measures made by Colonel Clark, of the Ordnance Survey. Although we believe the conclusions of Sir Henry James with reference to Egyptian metrology are open to some criticism, it will nevertheless be interesting to reproduce them in this place. According to him not only are our own but the Hebrew measures are derived from those of Egypt. The ancient Egyptians emp

loyed two measures of length; namely, the Common and Royal cubit. Of the latter, ten specimens have been found preserved in the ancient buildings of Egypt, the most perfect of which is that now in Florence, which is a slab of slate or schist. The other nine samples are of wood and are generally divided into seven palms apparently with a fine saw with as much or even greater accuracy than the generality of the measures with which the workmen of the present day are supplied. Of the common cubits there seems to be no simple specimen now extant; but on the other hand, the dimensions of some Egyptian monuments are known in terms of the ancient common cubit so that its value can be restored. Sir Henry James concludes that the length of the common cubit appears to have been 18.240 inches. Sir Henry James suggested that it is not unlikely that the Common and Royal cubits had some definite relation to each other, like that between the link and foot of surveyor's measures in our own country, and he infers that probably eighty-eight Royal cubits of Egypt were equal to a hundred common cubits of that country. The length of the English foot is exactly the average of the ancient Egyptian common and Royal foot, although it is probably so by accident only.—*Phil. Trans. Roy. Soc., London, 1870, CLXIII., 445.*

The following article from Michaelis on the subject of the weights and measures of the Jews will be of service here.

The Ell is a measure almost universally of 25 inches and he uses the word synonymously with *Sacred cubit*.

GENERAL OBSERVATION ON THE SUBJECT OF WEIGHTS & MEASURES, OF THE ISRALITES.

BY SIR J. D. MICHEALIS, PROF. OF PHILOSOPHY, IN THE UNIVERSITY OF GOTTINGEN.

An immutable standard of weights and measures is a matter of the highest importance in society, but it is difficult to find out a method of obtaining and preserving an invariable equality in regard to either, and there is besides another problem in the present case, viz: as to the manner in which a people depending on their neighbors for the benefits of commerce, and obliged to dispose of their commodities by their hands, and to take foreign articles from them, ought to regulate their procedure; and whether they should be prohibited from dealing by other weights and measures than their own invariable standards.

Although a nation may at first have a perfect uniformity of weights and measures, yet in course of time they will suffer alteration and imperceptibly become different, if the greatest care be not taken to prevent it.

That fraud will endeavor to alter them is very clear; as is also this truth, that a fraud long practiced becomes in a manner justified and sanctioned by proscription, and then again a new fraud begins playing its part. I will not however, as much as mention fraud, but suppose all men perfectly honorable yet, still weights and measures will not continue uniform. For in the first place, the very individual ones which I now

use will alter by time. By frequent use, a weight that I employ ~~loses~~ loses somewhat, just as our coins do, and at present, as I have already observed, we have none of the *louis d'ors* of Louis the XIVth, of real and full weight, but by one of full weight, taken in strict sense, we are obliged to understand one that is really too light by two aescens. In like manner measures of both wet and dry commodities, by various accidents have their shape altered, become imperceptibly bent out or bent in; acquire a periphery, which in a mathematical sence is not regular, a small curvature instead of an accurate angle; an imprecipitable dint, &c., &c; by which their contents, though perhaps but imperceptibly, are yet, in some degree certainly, affected. They likewise contract or expand, and if a small splinter of the wood comes off inside it increases the amount of the measure. Even measures of length do not continue for ever the same. And the less that the person who uses them, understands of mathematics, and of the importance of these apparent minutia the greater and more rapid will be the variations whereby he will deceive both himself and others. But the difficulty goes still farther. By these already in use, new ones are made, but perfectly alike they will not be, at least not so much so as that Leibnitz perhaps would, on account of the principal indiscernibility be afraid to object to them. The difference indeed will, if the copy is made by a careful master of his business, be infinitely small or properly speaking, imperceptible, but it will be more maternal, if he does not rightly know with what perfect accuracy he ought to go to work. We need not only examine how inaccurately the different sorts of measures are made, even by those tradesmen who are employed for that purpose, by communities and cities, whose magistrates do not understand mathematics, in order to be convinced of their incredible ignorance.

But even the most imperceptible error becomes greater, in the lapse of years, and by the time the thousandth or hundred thousandth copy is made the difference amounts to something preceptible and considerable. What we see in our own country may convince us of this, for how dissimilar are our weights and measures in Germany? To go no farther than our own immediate neighbourhood. In Boverten the very nearest spot to Gottengen, we find them different, indeed very

perceptibly different from what they are in that city, because Boverten belongs to Hesse. for amidst the gradually increasing dissimilarity of standards, every territory has been obliged to choose one for itself, perhaps by guess, or the same legal authority and yet it differs perhaps from that used in the very nearest principality, and thus gives birth to endless mistakes and impositions. But not even in the very same territory is the standards always the same. The laws may no doubt enjoin that it be so, but if we go from city to city, from district to district, we shall perhaps find but a very imperfect equality, which is not only a mischievous thing in itself, but opens a wide door for even greater dishonesty.

The mischiefs arising from these inequalities are very great. We cannot always make bargains perfectly sure, and hence we may, on this sole ground often receive from a merchant less than we have paid for. We think perhaps to make a great profit, because we buy cheap, and at this very time it turns out that we come worse off, because the measure we have received is smaller, while yet its name is the same. On another occasion we sell and the buyer has a larger measure, particularly the foreign merchant who travels through our country purchasing goods; or the the variety of injustice, fraud and self-deceit, which arises from this source, bring cities at last to poverty, and ruins the most flourishing companies in consequences of their not attending to it until too late. In ancient times when there were yet no coins, and silver was paid by weight as appears to have been the case before and throughout the Mosiac times, a still worse species of imposition or self-deceit must have arisen from the inequality of weights, for accordingly as the weight was above or below the truth, a man might extort more or receive less than what was agreed for.

The result of these observations is this, that every country ought to have standards of its various weights and measures carefully kept by men of skill, and out of reach of all falsification. Every country ought to have one common standard kept some where or other, for all its weights and measures according to which all others might be rectified. In England it has been proposed, (but whether the proposal has been carried into effect I do not know and at present I have no means of information). That those standards should be kept in the

exchange at London, with all possible care, under numerous keys, that thus many people might be present at the opening of this ancient national sanctuary, upon any momentous occasion.*

Once more: We generally have no superintendents of weights and measures, that are qualified for such an office. The magistrate, who is not aware of its importance and the effects which may here proceed from a trifling error once committed and continued, often devolves the superintendency of weights and measures, not indeed from unfaithfulness in the discharge of his duties, but from ignorance of mathematics upon the lowest of his underlings. And how many cities are there in Germany in which there is not one person invested with authority as a magistrate who has as much knowledge of mathematical science, as would be requisite for the due oversight of this important branch of police.

*This proposal and the loss that arises from the otherwise unavoidable variation of weights and measures was put in very clear light, in a book well worth reading, published in 1768, and entitled, "An Essay upon Money and Coins." That the Legislature noticed it, and took the matter seriously into consideration I perceive from the account given of the Parliamentary proceeding in the London Magazine for June, 1859; but I do not know whether any Act of Parliament on the subject has yet passed.

ART OF THE PLANS WHICH MOSES TOOK FOR THE REGULATION OF WEIGHTS AND MEASURES.

Before I yet go on to state the manner in which Moses proceeded in relation to this important problem of legislative policy, it will be useful to make some remarks on the sciences of the Egyptians, in whose learning he was educated. The intermediate class of their priests, the members of which, from knowledge of hieroglyphic writing were called Hierogrammateis, occupied themselves, as with other branches of science, so in a particular manner with that of weights and measures.

In proof of this, I shall only quote the Stromatra of Clemens Alexandrinus.*

Giving, however, the whole passage that relates to their different studies: "Now comes the" Hierogrammateus, who has a pen in his hand, "and in his hand a pen and ruler, with a vessel† containing

*Lib. viz. p. 757 of the Oxford edition, p. 269 or 633 of other editions.

†The words with a vessel, are indeed wanting in the Greek, but it is manifest that they must have been originally; for ink could not be kept in a ruler. I suspect that something more may have dropped here from the original, and that the clause had been to this effect: and by his side a vessel with ink, &c., such at least, is the costume of literary persons in the East at this day by which, when they go abroad, they are distinguished as such, and it was the same in the days of the Prophet Exekiel. See my father's dissertation. entitled "Riluaha Codicis sacri et Corano illustrata" 2.

ink, and the reed used for writing. It is his province to understand the hieroglyphics, as they are called, cosmography and geography, with course of the sun, the moon and the five planets, and in a more particular manner, and especially the geography of Egypt and the description of the Nile. He must also be acquainted with the description of the sacred vessels and the places consecrated to them, and the measure of all things used in the sacred transactions."

From this passage, it is not only clear that this class of priests must have been acquainted with measures, but their arises this probable conjecture, that the measures both of length and capacity had belonged to the number of the sacred things, and that, for the conservation of the sacred standards thereof, a certain consecrated place, not known to everybody had been appropriated. With this conjecture accords what we are told of weights and measures having been fully described in the books of the Egyptian Mercury, whom they called Thoth. Such a description is not possible by words alone without models; but the principal books of Mercury were (what, indeed, Jablonski thinks, the god Thoth himself was) the sacred stones (*otypai*) inscribed with hieroglyphic figures, and partly kept in the most sacred chambers of the sanctuary, even concealed in deep subterraneous galleries. Some of these stones, then, might have been the standard both of the longitudinal measure, and likewise of the cubit, which was equal to the measure of capacity, both for fluids and dry wares.

Here, then, we have a remarkable specimen of legislative policy, and when I consider Moses merely as a man without any reference to his divine mission, he must, methinks, but he has, at the same time, far surpassed them, and acted with much more honesty, than their policy which was so thoroughly interwoven with mystery and priestcraft, permitted them to do; for although he constituted the sacred tribe guardians of the sacred standardss, and imposed upon them the duty of acquiring a knowledge of weights and measures with mathematical accuracy, yet, of things in which all were interested he made no priestly mystery but placed certain models of them all in the view of all, describing them in books which were put in the hands of all the people. Considering him on the other hand, as sent by God,

it appears to me, that he had in this matter, by God's express command, done the very same thing that a wise people should have done of their own account, but in a much more honest and open manner, and, at the same time, in a much higher degree of perfection.

In the first place, the weights and measures were preserved in the tabernacle of testimony, in more ways than one, and partially in the view of every individual, for at least many hundred years. Some of them it is true might in course of time suffer some change, but for that very reason, there were various standards so that the errors of any one could be easily rectified by the others, and some of them were kept within the sanctuary itself, and were thus less liable to variation. In the description of the Tabernacle we may perhaps have read, with some degree of weariness many particulars relative to measure, in which we took no interest, and have often thought with ourselves in the meantime, "Why did not Moses rather leave this out? I should have dispensed with with it. Some people in order to assign some use to these measurements endeavor to discover in them a variety of types and mysteries. But, although I am very far from denying the typical nature of many of the Mosaic ceremonial laws, yet I cannot here agree with such people nor comprehend what moral, doctrinal or spiritual meaning there can be in ten ells long, one and a half ell broad, and a half ell thick. Others again equally short-sighted are so vexed at finding that these things are of no use, as to conclude with great theological depth that they could not be written by the command of God, because they contained nothing useful or edifying, just as if God should have the bible written for them alone, (a requisition by the way which they would never think of making in the case of any human work) or as if it were a book written by the immediate command of God, there ought to be nothing that did not minister to moral edification, and as if revealed religion did not reform us, that God had condescended to become a civil legislator to the people of Israel.

This specification of longitudinal measures, which we find so frequently repeated, answered one of the most important purposes of police to the Israelites, and as a master piece of legislative wisdom. in this respect it merits our admiration.

I shall now speak of their measures of length, measures of capacity and weights, separately, and in succession.

1st. The longitudinal measure was fixed for future ages in a great variety of ways. The Measures of the Tabernacle and its hanging, (Exod. XXVIII 8-19) of its curtains that covered the tabernacle (Exod XXVI 1-13) of the boards that framed it, which were made very little apt to alter [Exod. XXVI. 15 16,] of the tabernacle itself, which was 30 ells long and 10 broad; of the altar of burnt offerings overlaid with copper (Exod. XXVII. 1) are all specified in ells and that in a book which every Israelite was to read. It is true the curtains and the wood might be affected by exposure to the atmosphere, although, perhaps, one error would correct another, but still every Israelite that came to attend divine service in any future age would here obtain a pretty accurate view of the ell, and might at any rate measure some of those things with more perfect accuracy, and judge whether the nation still retained in common use the ancient original ell or not. Still less variation was to be dreaded in those archetypes of the ell that were kept in the sanctuary itself. Of the table of shew bread, (Exod. XXV. 23) the altar of incense (Exod XXV. 2) and the Ark of the Covenant, [Exod. XXV. 10.] all the dimensions are specified. They were made of Acacia wood and only overlaid with gold. But the most invariable of all the standards of longitudinal measures as being made entirely of gold, as the lid of the Ark which was two ells and half long and one and a half broad, [Exod. XXV. 17.] No doubt this Ark always remained in the obscurity of the sanctuary unless it happened to be brought into light by any rare occurrence, as during a campaign in the time of war. But for that very reason it was so much the more invariable; and could thus, if necessity required, serve after many centuries to ascertain whether any errors, and what had effected the other standards of the ell. I admit that at last a time would come when all those standards longitudinal would become useless, but nothing on earth endures forever. But then new standards could be previously made from others, and we find that this was actually done. When the tabernacle [according to the reading in the printed Hebrew text] was 480 or [according to another reading which Josephus and Paul found in the bible in common use in Palestine in their time] 392 years old,

and must certainly have been pretty much decayed. Solomon began the building of the temple. At this time they would from the remains of the tabernacle, still be able to ascertain the Mosaic ell. This measure was transferred to the temple; and the edifice which being built of stone was liable to still fewer changes, particularly in a southern country where no severe frosts make stones of a building separate from each other, was 60 ells long and 20 broad; and then without taking into account other expedients that Solomon might have employed for that purpose, the ancient Mosaic ell was preserved until the time of Nebuchadnezzar by whom this temple was destroyed. The numerous golden utensils which it contained, the vessel called the brazen see and the two copper columns Boaz and Jachin, of which the altitude and circumference were specified, answered the same purpose

Now the question is, have we ourselves such ancient and such authentically attested memorials of our ell, as it was 480,592, or, reckoning to the time of Nebuchadnezzar 903, 1015 years ago? [I know not whether we have or not; and I merely ask, how many readers will not be offended at me for my ignorance of many things.] And are these [I really do not ask this question for I well know the contrary] specified in a book, that is in every ones hands? From what I find merely in the details relative to the structure of the tabernacle, where it is so manifestly his object to fix in different ways, one uniform standard of measures, I am led to conjecture, that Moses had done still more with that view, and had given to the priests other special patterns of the ell, which they were ordinarily to use, and moreover one archetype which they were sacredly to preserve. Of this however he does not himself inform us; but if it was the case, the models mentioned in his writing would always serve the purpose of preventing any alteration from being made upon them either from carelessness or fraud, without its being quite manifest to posterity. This is actually more than what the author of the earliest essay upon money and coins projected in the year 1758, and parliament took into consideration. And if the British legislature were desirous to insure to future ages the true measure of the ell, on the Mosaic principal and plan, they ought to have it ascertained by the Mathematicians of St. Paul's

church with the most perfect accuracy, and to have an authentic record of the measurement drawn up in the plainest and briefest terms and published in a book which every Britian might read as easily at any rate as the Israelite heard the law read once every seven years in the catechisms, for instance, or the calendar, which should not be allowed to be printed without this appendix concerning St. Pauls. It is to be hoped that my readers are by this time somewhat reconciled to the Mosaic measures, and that they will no longer seek for types in the numbers, nor from the measurements whence they can derive neither edification nor amendment, deduce any more objection against the divine mission of Moses and the inspiration of his writing; else must I class them with the man who could not comprehend what could be the use a rampart of a fort, because he saw no crop of either rye or wheat upon it, therefore he could not be persuaded by all the assurances that were given him that it was formed after a plan drawn by the King himself. "It is not" persisted he, for use as a corn field, neither wheat nor rye grows upon it, and our most gracious sovereign could have had no hand in any such thing.

2d. The measure for corn and wine *measroe aridorumet fluidorum* were among the Hebrews more uniform in their proportions than ours are. For their *ephah* or bushel, and their *bath* [for liquid] were equally large. It is very certain that there was a standard of these measures in the *sanctum sanctorum* and that it stood before the Ark of the Covenant. Moses was ordered to place an homer of manna [and the homer is the tenth part of the *ephah* or Hebrew bushel before God, and it appears that the vessel was not of wood, but of gold, [Exod XVI. 33-36. Heb. IX. 4.] It is probable that there were various other measures in use, although Moses has not inserted in his writing any account of their contents. At this no one need be offended who joined in finding fault with the too frequent repetition of the ell, for in fact measures of description could not properly be specified in the books of law, because the standard vessel which was of gold, could not without risk of being injured or stolen, be put in view of every Israelite as the Tabernacle specified dimensions.

To notice however some probable example of standard measures of capacity, which may have been described in the catalogue, by which the sacred utensils were delivered to the priests and Levites, [Numb. 1. IV.] I would remark that belonging to the table of shew-bread, there were not only golden tankards [*twikam*] in which wine stood and from which it was to be poured out, but also small drinking vessels shaped like our cups likewise of gold. Now, considering Moses not sent from God but as merely versed in the learning of the Egyptians, we must think it probable that all these vessels had their contents very accurately determined. I presume that the same was the case with regard to the basons belonging to the altar of burnt offerings and for regulating the baking of the shew-bread and the flour for which the law fixed by bushels, there may have been a standard *ephah* within the sanctuary. Before the tabernacle stood the brazen laver. In the more particular description of the vessels delivered to the priests it was probably specified how much water each laver contained both when quite full, and filled only to a certain mark; and accordingly we find that the contents of this brazen sea, as it was called, are mentioned in both respects in the historical books of 1 Kings (VIII. 26.) and 2 Chronicles (IV. 5.)

3d. As to weights Moses specified them in the following manner:

20 gerahs make one shekel of the sanctuary* 3000 such shekels make one kickar† or talent, by this information alone, however, posterity would have not been much benefited, for the question would be, how much is a gerah? and it was replied, the twentieth part of a shekel; the question would recur, what is a shekel and if the answer was twenty garah they would have been in the same predicament in

*See Exod. XXX. 13. Levit. XXVII. 25 Numb. III. 47 XVIII. 16.

†This appears from Exod XXXVIII 25 26; where 301 775 shekels are reckoned 100 talents and 175 shekels more. Moses gave no statue relative to the talents as he did in the case of gerah and shekel, probably because there was no dispute about the talents every one reckoning it at about 800 shekles, whereas the one shekel might comprise more and the other fewer gerahs.

which the evil statesman stood when he catechised the orthodox collier on the subject of belief. If in the course of time, the shekel becomes smaller so likewise would the gerah diminish in the same proportion.

But here too a standard was provided in the tabernacle. The fifty boards of which the sides were composed, rested each upon two silver sockets and every one of these hundred sockets was the weight of a talent, [Exod XXXVIII. 27.] here therefore they had no fewer than a hundred standards for the talent, by which the shekel at any future period could be distinguished. If they lost anything by friction it was in proportion very trifling, whereas in the case of smaller weights like the shekel and gerah, the loss by wear or friction amounts to something more material. The golden candlestick in the sanctuary together with all its appurtenances in like manner, weighed a talent, Exod XXV. 31-39; and in the catalogue, according to which the different pieces of furniture belonging to the tabernacle were given in charge to their keepers, it was doubtless accurately specified, what was the weight of the gold candlestick, snuffers and of all whatever else belonged to it, and likewise of all the golden articles belonging to the table of shew bread and of the golden lid of the Ark with its cherubims. In this way they had a great variety of standards for their weights, and if in any of them by the wear of the gold, any small discrimination of weight took place others were always at hand to rectify the defect; but it is not to be forgotten that these standards of which some at any rate, could certainly lose nothing by in the course of a thousand years, from their being so sacredly preserved, were not of iron and copper, which, in process of time are corroded to rust and verdigrease, if exposed to dampness or even to acids, but of gold and silver, which defy moisture and the common acids. Nor was there any reason to apprehend that the gold would ever be wilfully or feloniously filed down for the profit of such sacrilege would have been too inconsiderable for people so rich as were the priests and even then, though we should represent them to ourselves as ever so destitute of principal they could scarcely run the risk of being stoned for a few grammes of gold, besides they must have had to redeliver the articles under their charge according to their weights when required, not to

mention the sanctity of the golden standards would make them shudder at the very thought of committing theft upon them in any shape. The best possible provision, therefore, was made for unalterable and authentic standards of weights. And now, as to the superintendents of weights and measures. These were much in the Egyptian style, the priests and Levites, to them the standards were delivered; and indeed article by article to particular persons* that so, if of gold or of silver they might redeliver by weight: besides the whole tribe of Levi were maintained by the public, in turn for devoting themselves to the sciences (Art. LII.) Nay, more, we find it expressly mentioned in Chron. XXIII. 29 that David, when he assigned to each Levite his department, appointed some to superintend the weights and measures†. Thus were these things really consecrated, and thus are the words of Solomon in Prov. XI. 16. true in a sense which readers seldom think of, "A just balance is sacred to Jehovah, and all weights are his works."

At the same time, however, Moses nowhere prohibits the use of foreign weights and measures, at least I can recollect no such prohibition, and from his so often mentioning the sacred shekel and in Lev XXV. II expressly saying: "All estimation of vows shall be made by the sacred shekel," which he did not prohibit, but only meant that every thing in his laws relative to imposts, penalties, &c., &c., should be understood in reference to the shekel of the sanctuary. At any rate there seems besides this sacred shekel to have been many foreign ones, and moreover a royal shekel, established by later laws (2 Sam. XIV. 26) and of a smaller weight than that of Moses, concerning which I have treated in another place‡ and the origin of which may have been the

*See Numb IV., the whole charter. From verse 82 we see that the utensils of the tabernacle, those even of less value were delivered by the Levites one by one, or as it is more properly expressed with names, every article therefore has its name, much in the same way as the two columns in the temple, Boaz and Jachin.

†Literally over all division and measure. Division is here put for various measures, and Luther has given no bad version of the passage according to its meaning *zu allem Genicht und Mass*. To all weights and Measures.

‡Commentatio de Siclo ante Erilium Babylineum.

following: As it was not forbidden to deal in common life by different weights, there arose in process of time, a much smaller, but variable shekel, and to prevent uncertainty and imposition the King fixed the weight of this common shekel more accurately, so that from time to time there were two lawful shekels current among the Israelites, the sacred and royal. Even Moses himself in his historical relations does not seem to adhere uniformly to his own measure, as for instance, where he described the coffin of Og, king of Bashan, as nine ells long and four broad measured by the elbow of a man; Deut. III. II. concerning which passage, I request that the remark of my German version of the bible may be perused. It is, no doubt, an imperfection of police to permit the use of different weights and measures, and it may be asked, why Moses did not go a step farther and expressly prohibit all but one set? We must here, however take into consideration the circumstances of the Israelites, and bear in mind, that not being themselves a commercial people, they were dependent for trade upon other nations; Phoenicians for maritime commerce and upon the Arabs for the caravan trade with other nations, that passed through Palestine. A people in such circumstances cannot altogether avoid making use of foreign weights and measures, if they would avoid being overreached by the foreign merchants in whose hands the whole trade is; only they should have one invariable standard of their own in which all others could be reduced and that they ought in justice to use it in dealing one with another. This standard may, no doubt, be departed from by an abuse, and the other foreign weights, &c., become current among the citizens, and I suppose it was such abuse that gave occasion to establish the royal shekel. Some writers however, look upon the royal and sacred shekels as the same and if that be admitted, much of what I have written here falls to the ground.

That Moses enjoins the use of a just balance and just weights and measures is a very obvious. The statutes relative this point occur in Lev. XIX. 35-37 and Duet. XXV. 14-16.

If it is forbidden, then, to have a great and small bushel, a great and small weight, the meaning is not that besides the shakel of the

sanctuary. they were not to have any other, not even in their dealings with foreigners to use their shekel but only they were not to have two different weights of the same denomination, a larger to purchase and a less to sell by. It would appear that these statutes were in the time of Moses, pretty sacredly kept, because he does not once mention any punishment as being annexed to their violation, but deems it sufficient to say: "Whoever committeth such unrighteous deeds is an abomination of Jehovah thy God." The very circumstances of their regarding balances, weights and measures as consecrated to the Diety might keep a people, while yet honest and religious, from fraudulent practice, as being offences in the sight of a holy God. In latter times however, we find the prophets often charging them with the use of false weights, &c. Concerning silver money, which was not coined but weighed, we have already spoken in Art. XXXII."

The impression given here that we derive our knowledge of weights and measures as well as our astronomy etc. from Egypt, in my opinion is a grand error. On the contrary the Egyptians obtained their knowledge of all these from Noah, who was prudentially cast upon the shores of what we call the new world. The possession of these measures by our race the British or Anglo-Saxon race shows overwhelmily that we are the custodians of the measures; and that they are found in the Pyramid of Egypt, only goes to prove conclusively that our race built the Great Pyramid and not idolatrous Egypt.

REGULAR MEETING,

April 17th, 1880.

Persuant to notice the regular meeting of the Society was held on Saturday evening instead of Wednesday.

Meeting called to order at 8 o'clock, Mr. Holloway in the chair, who called upon Mr. Latimer to open the meeting with prayer.

On motion the reading of the minutes was dispensed with.

Mr. Latimer presented the names of the following persons as candidates for membership, who on motion were unanimously elected, viz:

H. Q. Sargent, W. F. Beecher, J. Ralston Skinner, R. French, N. R. Wood, E. Colgrove.

The Chair then introduced Mr. T. Wilson, who proceeded to address the Society as follows, on the subject of



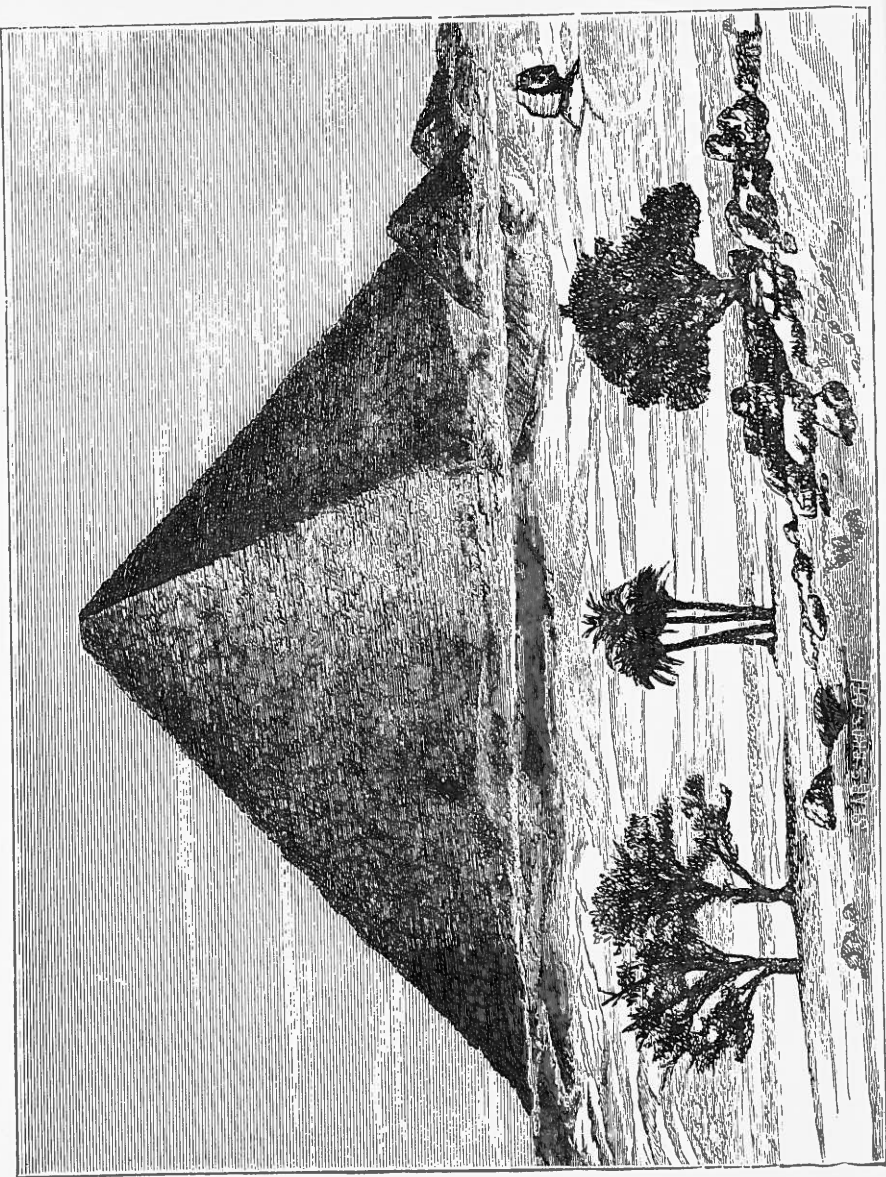
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APRIL 17, 1880.

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THE GREAT PYRAMID.

A PAPER READ BEFORE THE OHIO AUXILIARY SOCIETY, APRIL 17, 1880.

BY THOS. WILSON, OF CHICAGO.

After some brief introductory remarks Mr. Wilson said: Egypt has long been noted for its Pyramids, which are said to number about 38. Of these, however, three only have attracted much attention, belonging to what are known as the Jeezeh group, being located not far from the present city of Cairo. They stand on a dry rocky steppe and overlook on one side the sandy wastes of the interior, and on the other the green and fertile plains of the Nile, which are about 130 feet below them.

But among this noted group stands one that seems to take the lead of them all. Built as it is on the very edge of this great rock, and towering as it does above all the rest, it seems to declare in language unmistakable its superiority over all its associates. They appear to follow in the train only of this great progenitor.

The Great Pyramid is estimated to contain over 79,000,000 cubic feet of stone, to weigh over 6,000,000 tons, and it has been computed that the stones of which it is composed would serve to build a wall 5 feet high, one foot thick and 3000 miles long. If we should undertake to remove it by manual labor, and 7 persons were assigned to

each ton, it would require 42,000,000 people to accomplish the task, or 60,000 steam engines each drawing 100 tons.

But all these particulars of its structural greatness sink into insignificance when we come to consider its greatness in other and more important directions.

The investigations made during the last 12 or 15 years have revealed the fact that every part of the structure is alive with scientific and religious truths of a most wonderful character, truths which, at the time it was built none could have known but the Almighty Himself, except as He was pleased to reveal them to others. For over 4000 years this ancient patriarch has kept the heavenly secrets entrusted to its keeping, and not until these last days has it been given to man to know anything concerning it. Now, however, in the words of Dr. Seiss, "it would verily seem as if it were about to prove itself a sort of a key to the universe, a symbol of the profoundest truths of science, of religion and all the past and future history of man."

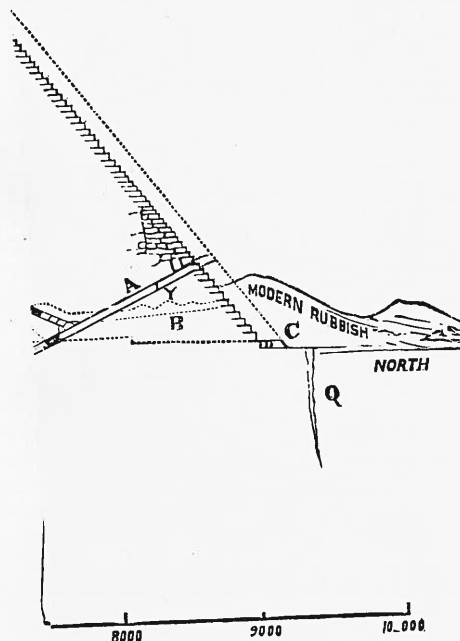
Some of these wonderful truths I shall endeavor to bring to your notice this evening.

Before doing so, however, it will be necessary to acquaint ourselves with the interior structure of the Pyramid. As will be seen by consulting the diagram facing this page, there is but one entrance and this unlike most entrances is not placed at the center of the base, but is about 49 feet above the base, and $24\frac{1}{2}$ feet east of its centre.

This is located on the north side of the building and the passage leading from it run so bliquely down through the masonry courses and through the solid rock, a distance of 367 feet to an unfinished subterranean chamber. At a distance of about 82 feet from the beginning of this passage, however, it is intersected by another, an ascending passage, which rises at about the same angle as the other [26°] until it joins another and more extensive passage at a distance of about 128 $\frac{1}{2}$ feet. This is known as the Grand Gallery. Its height is 28 feet, being 7 times higher than the passage connecting with it. Its breadth above the ramps is 6 feet 10 inches and its length on the floor line to a point where its southern wall line would intersect is 156.8 feet. On leaving this spacious gallery we stoop low and enter

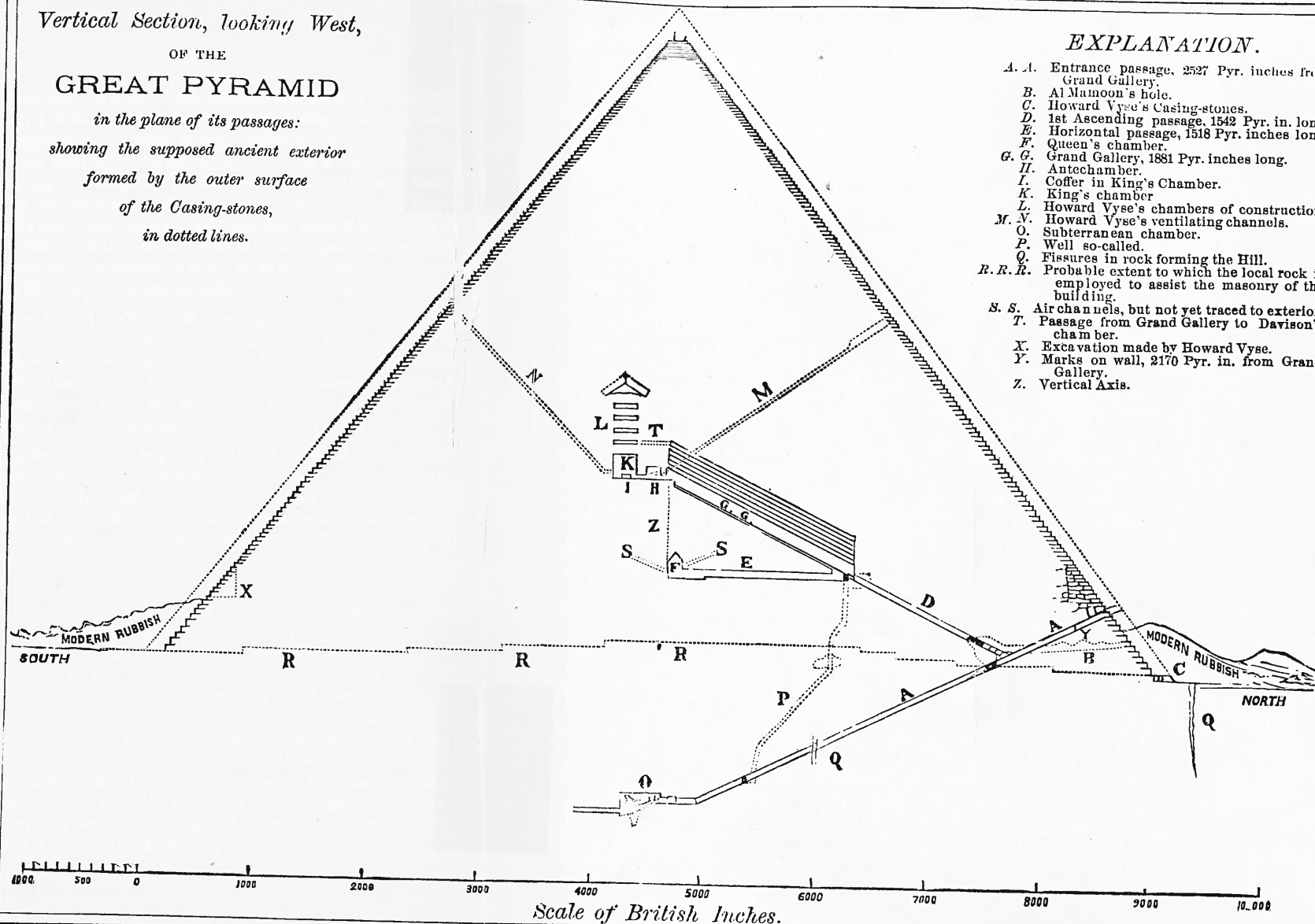
EXPLANATION.

- A. A. Entrance passage, 2527 Pyr. inches from Grand Gallery.
- B. Al Mamoon's hole.
- C. Howard Vyse's Casing-stones.
- D. 1st Ascending passage, 1542 Pyr. in. long.
- E. Horizontal passage, 1518 Pyr. inches long.
- F. Queen's chamber.
- G. G. Grand Gallery, 1881 Pyr. inches long.
- H. Antechamber.
- I. Coffin in King's Chamber.
- K. King's chamber.
- L. Howard Vyse's chambers of construction.
- M. N. Howard Vyse's ventilating channels.
- O. Subterranean chamber.
- P. Well so-called.
- Q. Fissures in rock forming the Hill.
- R. R. R. Probable extent to which the local rock is employed to assist the masonry of the building.
- S. S. Air channels, but not yet traced to exterior.
- T. Passage from Grand Gallery to Davison's chamber.
- X. Excavation made by Howard Vyse.
- Y. Marks on wall, 2170 Pyr. in. from Grand Gallery.
- Z. Vertical Axis.



Vertical Section, looking West,
OF THE
GREAT PYRAMID

*in the plane of its passages:
showing the supposed ancient exterior
formed by the outer surface
of the Casing-stones,
in dotted lines.*



a passage about $4\frac{1}{3}$ feet long, which leads us into what is called the ante-chamber, a little room $9\frac{2}{3}$ feet long, 5 feet wide and $12\frac{1}{2}$ feet high. Passing forward we come at once to another low passage $8\frac{1}{2}$ feet long, which leads us into what is known as the King's chamber. This room is $34\frac{1}{3}$ feet long, 17 1 6 feet wide and $19\frac{1}{3}$ feet high. Here is found the only piece of furniture in the entire structure, which consists of a stone box or chest, $6\frac{1}{2}$ feet long, $3\frac{1}{2}$ feet high and $3\frac{1}{4}$ feet wide. Of this unornamented and apparently useless article, we shall have occasion to refer to again. Two ventilators connect with this room from the outside of the Pyramid.

Under the Grand Gallery and running in the same direction, from north to south, is a horizontal passage $126\frac{1}{2}$ feet long, which begins on a level with the entrance into the Grand Gallery and leads forward to the Queen's chamber. This chamber is about 17x19 feet and has a ridged roof, while the ceilings of all the other chambers are flat. Two ventilators are connected with this room also.

Nearly 3 feet from the beginning of the Grand Gallery on the west side, is a ragged opening in which is the open mouth of a curious dry well, as it is called, which runs irregularly down through the masonry and rock foundation, until it intersects the descending passage a short distance above the subterranean chamber. About half way down it expands into a sort of grotto, bulge or subterranean bowl.

Below the entrance passage and a little to the west of it a rugged opening and passage way is seen leading from the northern face of the Pyramid to the junction of the descending and ascending passages. This forms no part of the original structure however, but is a forced opening made by Caliph Al Mamoun, about 1000 years ago, who determined on finding if possible the rich treasures the building was reputed to contain. At that time the entrance was closed and no one knew of its whereabouts. The treasure it was said to contain must have referred originally to the treasures of knowledge which were deposited in its passages, chambers, walls, angles, &c., treasures which we now begin to see, were of far greater value than the sordid wealth which Egypt's ruler sought.

We have now traversed all of the interior portions of the Pyramid that have been discovered and after viewing all its parts, the question naturally arises what does all this mean? For what end has all this great work been wrought? Various have been the answers given as already intimated, the accepted view for a long time was that this and all other Pyramids were built as tombs for the proud kings of Egypt. But whatever truth there may be in this as relates to other pyramids, it certainly is not true of the Great One. No theory of this kind will account for its numerous passages and chambers above and below, nor for many other features which we shall shortly present. And here we may mention the fact that no other pyramid in existence contains anything more than the downward passage and the subterranean chamber. Here is a marked difference then between the Great Pyramid and all others.

Prof. Proctor in his efforts to account for the existence of this grand building without the aid of supernatural interposition, has advanced the theory of astrologic uses. But in his efforts to sustain it, he displays his weakness and leaves untouched many important parts of the structure. The fact is, all efforts to account for its existence from a human standpoint, alone, fail. It is my firm conviction, after much study of the subject, that the Great Pyramid is a building from God; its architect, whoever he was, being Divinely inspired for the work he had to accomplish. In no other way can we reasonably account for the wonderful knowledge it contains.

To illustrate :

1. It contains astronomical knowledge of the most refined character, giving the true distance of the sun from our earth ; the true length of the solar year ; the length of the earth's polar diameter and the length of the precessional cycle.
2. It contains God-given standards of weights and measures, both of capacity and length.
3. It contains also what no uninspired man could have placed there, viz : a perfect chronological record from the beginning of the world to the present time, and still future—a record too which agrees with the written word from the same divine author, God.

Now, if this be true [and I can prove it] what shall we say to the origin of this wonderful building? Shall we say that it is only the work of man, unaided by God? We cannot do it. No man ever lived who possessed naturally such wonderful gifts of knowledge and prophetic foresight. If it be from God, then with what force its teachings come to us, and with what reverence we should receive its sublime truths.

With these prefatory remarks we will now proceed to an examination of some of the remarkable features referred to.

First, with reference to the sun's distance from our earth. It is well known that this has been an open question which astronomers have been trying to settle for many years past. Some asserted one distance and some another, but for a long time the accepted view was that it was distant about 95,000,000 miles. After awhile this began to be disputed and the question of its distance was again sharply agitated, and the last transit of Venus was looked forward to with much interest by scientific men, inasmuch as it was expected that data would be obtained at that time which would enable them to approximate very nearly to the truth on the subject.

Years before this time, however, indeed while the 95,000,000 distance was accepted as true, an English gentleman who had studied the Great Pyramid and its measures, made a calculation from it as to the sun's distance and concluded it to be 91,849,270 miles. But differing so much from what was then accepted, as the true distance, he put his memoranda in his drawer where it lay for years, until astronomers began to contend for a much nearer distance. Finally the transit of Venus came, calculations were made, and results published, and what is the final conclusion? They tell us that the distance is 91,840,000 miles, a difference of but 270 miles from that which was obtained as a conclusion from the Pyramid years before. The mode of obtaining it from the Pyramid is follows :

The Pyramid is built on the 10-9 proportion, that is, for every 10 feet it advances inward on the diagonals of the base, it rises 9 feet on the central axis line. So that the Pyramid being 5819 inches high ; if we raise this to the 9th power, and divide it by the number of inches in a mile, the product will be the sun's distance as already stated.

If we take the sun's distance and divide it by twice the Pyramids height, the length of the earth's axis is derived, viz: 7899.56 miles.

I have stated that the Great Pyramid contained a true and God-given standard of weights and measures. This I shall now undertake to demonstrate.

Passing from the Grand Gallery through the lower passage, we immediately enter the ante-chamber. But upon doing so, our progress is barred at once. Stretching across the room from east to west is a huge granite beam, cemented at each end into a grove cut into the wall. Its lowest point is nearly 44 inches above the floor, and its highest point 57 inches below the roof, so that, although we can stand upright before it yet we cannot go forward, unless we bow under it, or climb over it. The builder who placed it there virtually says to all who reach this point "examine this granite bar before you go farther." Let us examine it therefore.

It is composed of two huge blocks resting one upon the other. The north face of the upper block has been cut away over the whole surface, so as to leave a projecting boss near the middle. The projection of the flat face of the boss from the face of the beam is one inch. The length of the anterior straight line which forms the base of the flat face, is 5 inches, and the base of the boss is 5 inches above the horizontal joint of the two blocks which form the beam. And lastly, the axis of the boss is just one inch west of the center or axis of the chamber. So that we here have an exhibition of one inch twice, and twice we are shown five inches. The extreme distance between the grooves in which the beam is cemented is 48 inches, half of this is 24 inches: but the axis of this singular boss is just one inch west of the center: hence it is just 25 inches west of the eastern groove: and 25 is the fundamental number 5. Here then is presented a simple table of "just and perfect measure," a measure too which was used by the architect of the Great Pyramid in the construction of all its parts.

Now it is a remarkable fact, as has been testified to by some of our ablest scientists, that the earth's polar axis measures as nearly as it is possible to estimate, just 500,000,000 of these same inches. This being the case what have we here on this wonderful granite bar? We have the following simple table or geodesic standard.

Earth's polar axis	1 inch.
500,000,000	
5 inches—1 palm.	
5 palms—1 cubit.	
1 cubit—semi-polar axis.	
10,000,000.	

1 cubit, therefore, of 25 inches is just 1-1,000,000th of the earth's semi-polar axis, and 1 inch is 1-250,000,000th of the same.

How simple and yet how perfect! How incomparably more is it than that complicated and imperfect standard known as the French Metric, which a certain clique of interested parties are attempting to force upon this nation. One was born from above and the other from beneath. Let us compare for a few moments the two.

How was the French metre obtained? By the direction of the French government, Delambre and Mechain, undertook to measure an arc of a meridian, starting from the parallel of Dunkirk in the extreme north of France, and terminating in the parallel of Barcelona in Spain. From this measurement they computed the whole quadrant, and subdivided it into ten million parts, each of which parts they called a metre. So that the French metre is intended to be the 1-10,000,000th part of a quadrant of the earth's surface. But as I saw it stated in a recent school book which contained a chapter on the French Metric System for the instruction of our children, "it is now known that there are irregularities in the form of the earth which would make such measurements give different results when taken in different places, and that the meter thus established is about 1-5000th of an inch too short."

As another evidence of imperfection in the French meter, we quote the words of Barnard of Columbia College, one of the most prominent advocates of the French system in this country. He says, "If the work was to be done over again the French metric system ought to adopt and doubtless would adopt, not their superficial earth-measure, the meter, but the Pyramid axial reference of the cubit, on

account of its immense superiority in fact and geometric idea." And that accomplished mathematician and giant in science, Sir John Herschel, who for 50 years was a member of the Government Commission for Standards, resigned his office rather than be mixed up with the advocacy of what he pronounced to be, "not a blunder only, but a sin against geometrical simplicity."

Thus we see that the French meter, its own friends being witnesses, is imperfect and if it had to be reproduced its friends would adopt the much more simple and perfect system of the Great Pyramid.

And what is this French metre which we are asked to adopt? It is an incommensurable length known as 39.37079 inches. How does this 39 inches with 5 decimal figures as a tail piece, look alongside of the simple, earth commensurable cubit of 25 inches? And when we come to subdivide and multiply, which will our children learn the most readily, or even children of larger growth who are called upon to figure extensively in business? The answer is too apparent.

Just imagine for a moment that the French metric system has become the law of the land, and we are obliged to conform henceforth to this preposterous abortion. Your boy is going down town and you want to order a few things for immediate use. You have a memorandum written as you have been accustomed to write, and it calls for

One 16 foot scantling, 2x8.

A half bushel oats.

A pint of milk.

One pound of Steak, and

Six grains of Quinine.

Under the new law you must transpose this in conformity with the French system, which you do after studying your French tables an hour, and then you hand your boy the order instructing him to get the following articles

One scantling, 4 meters, 8 dekameters and 3 hektometers long.

One double dekaliter of oats.

One Demiliter of milk.

Four Hektograms and 8 Dekagrams of Steak, and

Four centigrams and 8 milligrams of quinine.

It strikes me that many such transpositions would drive the

transposer crazy, to say nothing of the thousands and hundreds of thousands of mistakes which would inevitably follow, involving endless trouble and litigation, and in the medical world causing an untold number of deaths as the result of wrong doses based on erroneous transpositions by our doctors.

But we cannot dwell longer on the imperfections of this monstrous abortion, but will call your attention once more to the Pyramid cubit of 25 inches. We stated that this was the cubit used by the architect of the Great Pyramid in his work. An evidence of this is seen in the length of each base side of the mighty structure. Using this unique cubit as our standard and proceeding to measure the base from one corner to the other, we find that it is $365\frac{1}{4}$ cubits in length, or to be more precise 365.242 which is the exact number of days in a solar year. Here then is an astronomical problem solved in the measurement of a Pyramid base side by the 25 inch cubit revealed in the ante-chamber.

Another exhibition of this cubit value is seen in the following proposition:

The length of the King's Chamber is 412.132 inches. Now, if we construct a square with 412.132 cubits on a side, the area of that square will equal a circle whose radius is 232.520 cubits, and this latter sum is the height of the Pyramid in cubits of 25 inches.

Again, if we inscribe a circle with a diameter of 412.132 cubits, then the area of that circle will be found to equal a square having 365.242 cubits for the length of its side, which is already shown in the length of a base side of the Great Pyramid.

Thus we see that the King's Chamber length in inches expressed in terms of the sacred cubit a relationship both to the height and breath of the Pyramid containing it.

There are other exhibitions which go to confirm the use which the architect made of this earth-commensurable cubit, but we must leave them and proceed with illustrations of other problems.

As has already been shown, there is a relationship existing between the height of the Pyramid and its base. That is, using the Pyramid's vertical axis length as a radius and inscribing a circle there-

with, it will be found that the diameter of the circle as created will be related to its circumference as 1 is to (π).

As all may not be familiar with the meaning of (π) in this connection, I will simply state that π is the name of the letter p in the Greek alphabet and has been adopted by mathematicians to express a known quantity,, which quantity is 3.14159x or the circumference of a circle whose diameter is one. This has been commonly known as "squaring the circle."

This relationship of 1 to π is shown in numerous parts of the Pyramid. In the ante-chamber where we found the granite beam it is shown. On one side of this chamber is a granite wainscot 103.03 inches square. The chamber itself is 116.26 inches long. Then 116.26 is the diameter of a circle having equal area to a square of 103.03 inches in the side. So that here is an exhibition of the π proportion again.

If we compute the number of cubic inches in the whole beam which stretches across the ante-chamber, we find the total to be 31,415.9 which is an exact expression of the value of π by a change of points.

Leaving the standard of linear measure, we will now give an instance of Pyramid capacity measure.

Coming again to the granite beam and the boss upon it, we find that this wonderful little projection contains a cubic content of 28.5 inches and this quantity of pure water at mean barometer and thermometer weighs a pound and its capacity is one pint. The pint now in use differs not more than 27-1000th part from the Pyramid pint and in the days before George IV it differed only 13-1000. There was then a popular couplet which everybody was familiar with, which read like this:

"A pint's a pound all the world round."

Since then some of the wise men have changed it so as to express a nearer relationship to the fact as it now exists, and it reads

"A pint of pure water weighs a pound and a quarter."

The lower stone of the granite beam contains 17.812.5 cubic inches and the British standard Quarter differs from this only 4-1000th. This standard or Imperial Quarter is the highest denomination in the table of measures. But as it is a Quarter, the question naturally arises, of what is it the quarter? For an answer to this we must go forward into the King's chamber. Here we come in contact again with the empty stone box, known as the coffer, one of the most remarkable features of the whole structure. The cubic content of the void of this coffer is 71.250 inches, and the cube of the material forming the coffer is also 71.250 inches. And again, the cube of the bottom of the coffer is just half the cube of its side and ends. Hence the cube of the void of the coffer is four times the solid content of the lower stone of the Standard Bar in the ante-chamber, which was equivalent to the British quarter. Hence the British quarter is a quarter of the coffer of the Great Pyramid. And the old Anglo-saxon chaldron, as near as we now know, must have been very near the capacity of the coffer.

Again, the void (or empty space) of the coffer is 2500 times the solid content of the little boss, which as we showed is the standard of one pint and one pound. Hence, the void of the coffer contains 2500 pint units, which, if of water, weigh 2500 pound units, or a Pyramid ton. Thus the great standard of capacity is 50-2 times the unit, as the great length standard the cubit, is 5-1 times the unit.

In the matter of large surface measure the British Imperial acre, differs from an acre of 100 sacred cubits on a side by only 1-1000.

Of the ancient origin of these measures as well as their Divine source there can be no question. That the Lord placed great importance in correct and just measures no one can dispute who reads the scriptures upon that subject. A false and unrighteous measure is declared throughout the scripture to be an "abomination" to the Lord. His words are "just balances, just weights, a just ephah and a just hin shall ye have,"—"perfect and just." And when He gave Noah commandment to build an ark of safety, and Moses commandment to prepare an Ark of the Covenant. He gave each of them particulars as to the measures of their various parts. And that the God who knoweth all things from the beginning, and who guided the one who

prepared the coffer in the Pyramid, is the same who directed Noah, Moses and Solomon, is very evident, as the proportions existing in the coffer are found duplicated in Noah's Ark, the Ark of Covenant prepared by Moses, and also in the Temple of Solomon. Time will forbid a demonstration of this at present, but such is the fact as you may easily learn for yourselves by comparison and computation.

The near relationship that is found to exist, even now, between the standards of measure, weight and capacity of the Anglo-saxon race, and those ancient standards embedded in the solid stones of the Great Pyramid, is something very remarkable. It seems to tell us of a relationship of another character—a relationship by actual descent from those ancient, wise and God-fearing children of Seth, who built the Pyramid. There are other curious evidences of our relationship to this ancient structure and those who built it. For instance, the seal of our country bears on its obverse side a view of the Great Pyramid with its present unfinished top, and the all-seeing eye of God resting over it.

Not only so, but the very coins of our country bears testimony to our origin also

For instance, the 'dollar of the fathers' weighs 412.5 grains, the length of the King's chamber. The half dollar weighs 206.2 grains, the breadth of the same chamber. Our gold eagle weighs 232.2 grains the height of the Pyramid expressed in cubits, and the half eagle weighs 116.1 grains, the length of the ante-chamber. As shown before, this is the length of a diameter of a circle whose area is equal to a square having 103.03 on the side.

Now as there are 360 degrees in the circumference of a circle, its diameter in terms of seconds is 412,529 and its circumference is 1296. Then the number 412.5 (or weight of the silver dollar) is the thousandth part of the diameter of a circle in terms of seconds, and 1296 the number of square inches in an English square yard, is the thousandth part of a circumference of a circle in terms of seconds. This at once connects the English with Pyramid measure, and in the weights of the quarter dollar and half eagle we have had the squaring of the circle problem typified without knowledge of it. Such are

some of the coin relationships with the great Pyramid, all testifying to very remote relationship which we may doubtless claim with the Sethites and Shemites of the past.

With reference to the chronological features of the Pyramid I cannot do much more than introduce the subject to night, as it is really one of vast importance and great magnitude. Some things you will have to accept upon a mere statement, as I have not time to demonstrate every point I shall advance.

As an introduction then I will state that it is capable of abundant proof that the passages of the Great Pyramid, on the floor lines, represent a continuous record of chronology, and it is reckoned on the scale of an inch for a year. This feature of the use of an inch for a year is exhibited in the base of the structure. The base, of course, is composed of two right angled triangles, if we measure the length of each hypotenuse of these triangles we shall find the product of the two to be 25,827 inches, which represents the length of time or number of years occupied in what is known as the precessional cycle. Thus an inch represents a year of time. The same problem is exhibited on the 50th course of masonry—the level on which the King's chamber rests. There are other proofs which we will not now take time to give.

A glance at the entrance passage from its mouth down to a point where it intersects the base of the Pyramid, and a line drawn from this point along the base to the foot of the Pyramid and then along the face of the Pyramid slope to the point of departure, will disclose an angle, but not a right-angled triangle. In order to make it such it will be necessary to extend the entrance outside the present slope of the Pyramid, to a point at least where a perpendicular line would intersect the lowest point of the Pyramid's slope as the base. This would carry it 600 inches beyond its present beginning point. But we made a discovery in connection with the Great Step of the Grand Gallery which compels us to go out farther than this—in other words to create there a much larger right-angled triangle than the one we have indicated.

The great step, as it is called, is found at the terminus of the Grand Gallery and has called forth many inquiries and much investigation. It interrupts the slope of the Grand Gallery floor line at a point $81\frac{1}{3}$ inches from its southern wall. It is a step $36\frac{1}{2}$ inches high and 73 inches long on its horizontal surface. It is a right angled triangle in shape. The discovery I made in connection with this remarkable step was this. I found that its proportions when transferred to the imperfect angle at the entrance passage before referred to, not only completed the angle to a perfect right angle triangle, but it also developed the most astonishing results chronologically speaking, as well. It is very important that I should be understood upon this point, hence I call your attention to the diagram refering to it.

Thanks to Mr. J. R. Skinner, of Cincinnati. I was struck with certain remarkable figures which he placed on the cover and title page of his excellent pamphlet, entitled "The Crown Jewels of the Nations are their Measures." These figures, reading them as they stand in the Hebrew, were 5153; 6561. Having already discovered and published this feature of the step being related to the entrance passage, and having also shown its bearings upon chronology by furnishing the missing link—the time before the flood—I was more than usually interested in any figures which correspond with those I had been working with.

As Mr. Skinner referred to Genesis XVIII.10 in connection with the figures I referred at once to the original Hebrew, where they occur and what was my surprise and gladness to find, not only the two words whose numerical value yield the figures he gave, but to find also one more word, which combined with the two already given, furnished me the strongest confirmation possible of the truth of the discovery I had so recently made. Not only so, but it afforded a proof amounting almost to a demonstration of the fact, that God's hand was in the very beginning of this great work, as I believe it is now in its endings.

The two words used by Mr. Skinner were *haohel vehu* and their numerical expressions as I have already stated when read from right to left as the Hebrew reads, is 5153; 6561. What his object

AGRAM.

*relating to the Use of the Great Step of the
y to Bible Chronology, the Geometrical
&c., of the Great Pyramid.*

NATION OF DIAGARM.

triangle of the Great Step in Grand Gallery.
, and enlarged 100 times on the Antechamber



DIAGRAM.

*Exhibiting New Discoveries relating to the Use of the Great Step of the
Grand Gallery as a Key to Bible Chronology, the Geometrical
Proportions, &c., of the Great Pyramid.*

EXPLANATION OF DIAGRAM.

EXPLANATION OF FIGURE 1.
 B C, the right-angled triangle of the Great Step in Grand Gallery, in a reversed position and enlarged 100 times on the Antechamber scale.
 B N, the line from crease to crease, measuring line.
 B R, the line from crease to crease, in length of the Jehovah line.
 B A equal to three times

triangle of the Great Step in Grand Gallery,
and enlarged 100 times on the Antechamber
of Adam to Noah; also the Jehovah
of Adam to the Flood.
as in length of the Jehovah line.

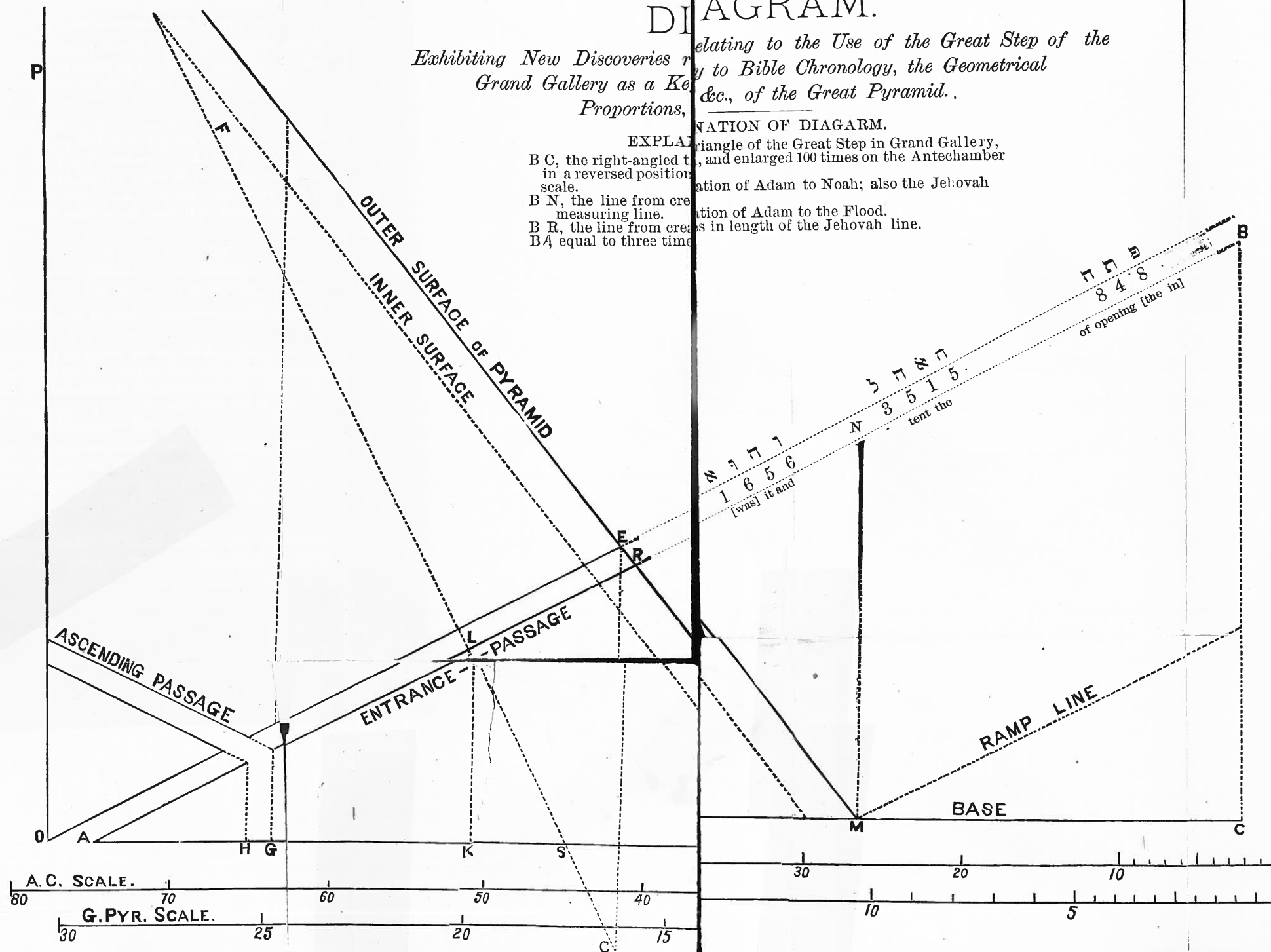


DIAGRAM.

Exhibiting New Discoveries relating to the Use of the Great Step of the Grand Gallery as a Key to Bible Chronology, the Geometrical Proportions, &c., of the Great Pyramid.

EXPLANATION OF DIAGRAM.

B C, the right-angled triangle of the Great Step in Grand Gallery, in a reversed position, and enlarged 100 times on the Antechamber scale.
 B N, the line from creation of Adam to Noah; also the Jehovah measuring line.
 B R, the line from creation of Adam to the Flood.
 B A equal to three times in length of the Jehovah line.

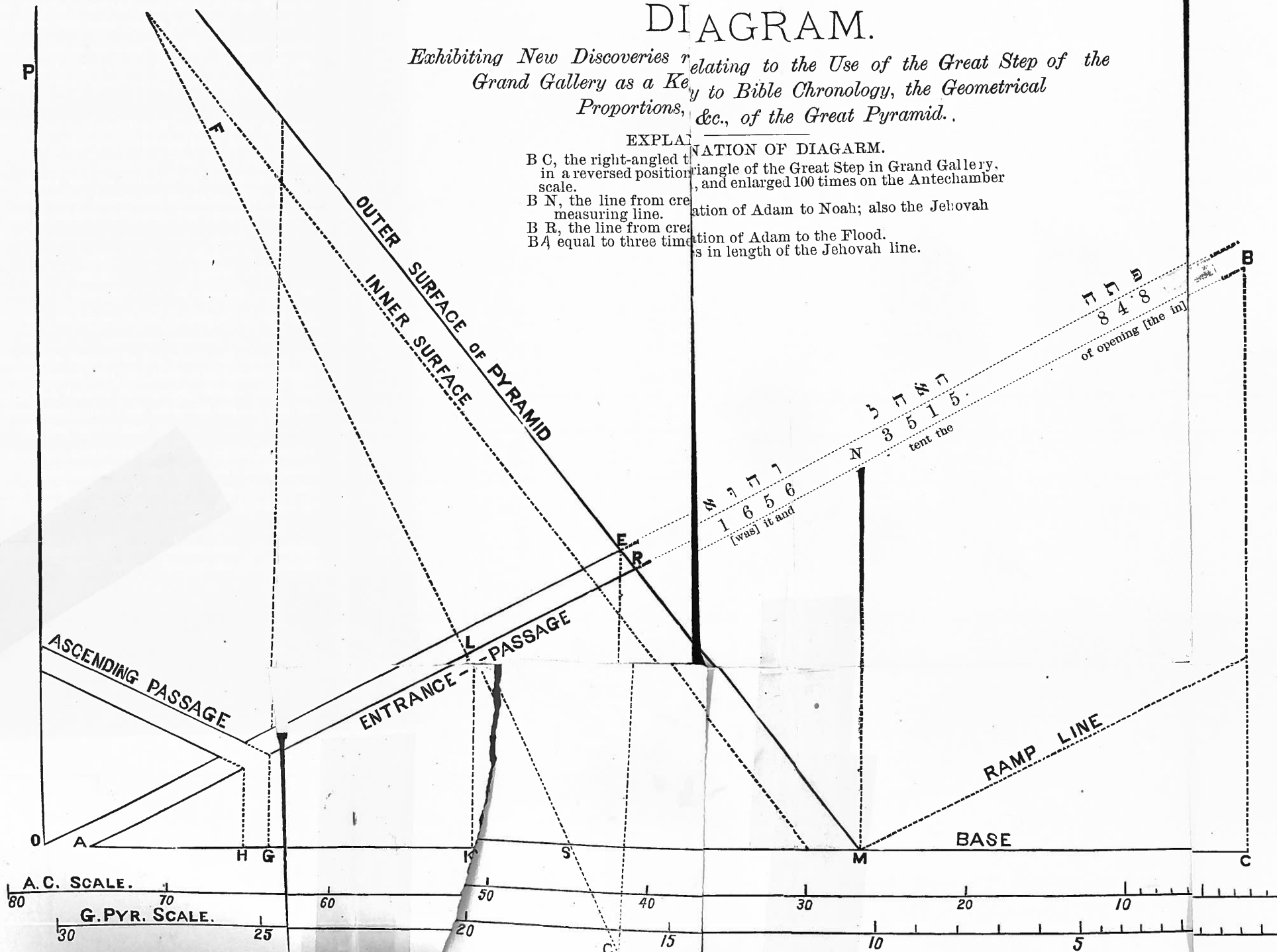


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B R, the line from creation of Adam to the Flood.

B A equal to three times in length of the Jehovah line.

A.C. SCALE.

G. PYR. SCALE.

Exhibiting New Discoveries relating to the Use of the Great Step of the Grand Gallery as a Key to Bible Chronology, the Geometrical Proportions, &c., of the Great Pyramid.

EXPLANATION OF DIAGRAM.

B C, the right-angled triangle in a reversed position scale.	triangle of the Great Step in Grand Gallery.
B N, the line from creating measuring line.	and enlarged 100 times on the Antechamber
B R, the line from creating measuring line.	of Adam to Noah; also the Jehovah
B A equal to three times	of Adam to the Flood.
	in length of the Jehovah line.

DIAGRAM.

Exhibiting New Discoveries relating to the Use of the Great Step of the Grand Gallery as a Key to Bible Chronology, the Geometrical Proportions, &c., of the Great Pyramid.

EXPLANATION OF DIAGRAM.

B C, the right-angled triangle of the Great Step in Grand Gallery, in a reversed position, and enlarged 100 times on the Antechamber scale.

B N, the line from creation of Adam to Noah; also the Jehovah measuring line.

B R, the line from creation of Adam to the Flood.

B A equal to three times as in length of the Jehovah line.

A.C. SCALE. 0 10 20 30

G.PYR. SCALE. 0 10 20 30

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was in placing them where he did I have not seen stated, but I gather from the use he makes of them in his work that the reason is, because they are the God-given numbers which express the π proportion. For instance, multiply this 5153 by 4 and the product is 20,612. Then as 6561 : 20612 diameter to circumference and so is 1 to π .

This was probably the reason therefore why Mr. Skinner placed the figures where he did, and it was a good reason, and taken in connection with the discovery I have since made, adds great strength to the whole-

Before proceeding farther however, I wish to state what may and what may not be well known, that every Hebrew letter has a numerical value, similar to our Roman numerals. The first letter in the alphabet for instance, *Aleph* has the value of 1; the second letter called *Beth*, 2. The letter called *Lamed* has the value of 30, and so on. So that figures may be made to talk, and that they do talk we will now demonstrate.

1656	3515	848	
<i>zehu</i>	<i>haohel</i>	<i>pathah</i>	
(Trans.) (was) it and	tent the	of opening	(the in)

Read from right to left, we have—In the opening of the tent and it was.

Here we have not only in figures the key which unlocks the untold treasures of this vast Tent of God, but those same figures actually tell us in plain language that here is the opening of the tent. For over 4000 years this proclamation has been made and yet no one has been found until now who had ears to hear it.

But not only do these wonderful and mysterious figures furnish a key to the geometrical proportions of the tent, and point with unerring finger directly to its opening, but they do even more, they declare the length of time that elapsed from the creation of Adam to the time of the Flood.

What an astonishing combination and condensation of infinite wisdom and prophetic knowledge is here! Surely this is the work of God.

And how appropriate it is to name this repository of truth a *Tent*. How like an ancient tent it is. The tents used by those Nomadic races of the East were precisely of this shape—a tent pole in the center and their coverings fastened at four corners. Such no doubt was the form of the tents in which Abraham, Isaac and Jacob dwelt while journeying in Canaan and Egypt. So that while men have been naming it some one thing and some another, yet it has been proclaiming itself all the while simply a *tent*. What simplicity, and yet what grandeur.

In entering upon this new field of chronological inquiry as opened to us by these recent revelations, new and grand results may be expected. Some glimpses of what is in store for us have already been seen and I will name them to you.

For instance, from the beginning [or Adam] to a point where a perpendicular line will intersect the extreme limit of the Pyramid base, the distance is 1056.5 inches, and as it is 600 inches from that point to the Pyramid's slope or end of the 1656 line, and Noah was 600 years old when the flood was upon the earth, then this 1056.6 line brings us to the birth of Noah, whose name signifies "comfort." And in view of the generic character of the 1656 line we are warranted in asking whether there is any significance in this first and original line? Our search in this direction was rewarded with the following answer, the figures 1056.5 in Hebrew letters give forth the most wonderful name in the universe, the name "Jehovah." Here then the very first measuring line that is given us is the Jehovah line, and a most important one it is. Beginning in the Garden of Eden and marking its first terminus in Noah, of whom it was said at his birth, "this same shall comfort us concerning our work and toil of our hands, because of the ground which the Lord hath cursed."

The second terminus of this Jehovah line brings us to the time when God covenanted with Isaac, and the third terminus reaches to the time when the people of Israel demanded a King instead of judges as formerly. We know how God looked upon this. Addressing Samuel who was judge at the time, he said: "They have not rejected thee, but they have rejected me, that I should not reign over them."

So we find that the Jehovah line stretches out three times [triple Jehovah] and then ends in His rejection by the nation of Israel as their ruler. And strange to say the line of Jehovah ends where Saul is chosen in His stead, and Saul is the equivalent of *Sheohl* and *Sheohl* is *Hades*, the underworld—hell.

I have found also in the name of Israel a number which agrees exactly with the whole time that elapsed from the period of his birth up to the time when the Israelitish laws and instructions were superseded by the Christian. And in the name of Isaac I have discovered a key to the chronological period which begins where that of Israel ends, and goes forward to the close of the dispensation.

I have discovered also numerous other lines which in their unerring measurements point out the time when Abraham was called to go to the land of Canaan—when Isaac was born—Jacob born—when Israel went forth from Egypt—the time of their wanderings—of their settlement in Canaan, the length of the time they were ruled over by Judges—by Kings—their captivity and release—the 70 weeks of Daniel's prophecy—the birth of Christ and the time He began His ministry. The time when Jerusalem was destroyed and even the time when that final destruction came under Bar Chochebas. These and numerous other astonishing results are attained by a use of these mysterious and hitherto secret measuring lines.

Time will forbid any further illustration of these most interesting and I may add most important problems. At some future time, God willing, I may be permitted to enlarge more in detail on this branch of Pyramid study.

In conclusion then my friends I ask you what are we to say in regard to the origin of all these scientific, chronological and religious truths? Remember how long they have been treasured up in this ancient tent. Who placed them there in such microscopic perfection? Who knew, at that early day, all about the heavens and the earth, truths many of which it has been left for the highest attainment of science in our day with all its modern and perfect instruments to approximate to a knowledge of. And again, who of mortal man could

read the history of the future for thousands of years to come and actually mark in an unmistakable manner the great events of that long series of ages, in the stones of the Pyramid? We may ask, indeed, but no answer can be given. When we find one who can respond to all these requirements, that moment we find a God.

There is but one conclusion then my friends which sound reason and good common sense will bring us to, and that is, God the Maker of heaven and earth, the source of all wisdom and all power, is the author of this ancient tent of the desert. He alone could fill it with such evidence of knowledge—such grand and heavenly secrets. To Him then let us give all the praise, not only of its early beginnings, but also of its latter day revelations. Study it in the light of the bible and in a spirit of humility and faith and your labors will be blessed with results of the richest character.

After Mr. Wilson concluded, Mr. Skinner made some confirmatory remarks on the statements of Mr. Wilson, bringing out the curious fact that the cartouch the only emblem found in the Pyramid, and heretofore supposed to be the name of some Egyptian king was nothing more nor less than another form of the Hebrew name of Jehovah, showing conclusively that the Pyramid was Hebrew not Egyptian.

On motion of Mr. Latimer, the thanks of the Society were tendered Mr. Wilson, for his able and instructive address.

On motion adjourned.

REGULAR MEETING,

April 28th, 1880.

Society met pursuant to adjournment.

On motion Mr. Charles Latimer took the chair, in the absence of the President. After prayer by the chairman the Secretary read the minutes of the last meeting. Mr. Latimer presented the following names as applicants for membership: William Payne, Isaac New-

ton, T. S. Ingraham, S. M. Arthur, and Henry Burns, all of whom were elected.

Mr. Latimer announced that several ladies of his acquaintance were desirous of joining the society, and requested the members to canvass among their lady friends to secure their co-operation.

The chair announced the receipt of the following valuable books, pamphlets and papers, all of which have been added to the library.

THE SOURCE OF MEASURES:—by J. Ralston Skinner, from the Author.

PHILETIS:—by Chas. Casey.

THE PYRAMIDS OF EGYPT:—by E. W. Fish.

PROCEEDINGS OF AMERICAN METROLOGICAL SOCIETY.

OUR INHERITANCE IN THE GREAT PYRAMID:—by P. Smyth.

Presented by Charles Latimer.

50 COPIES OF THE BATTLE OF THE STANDARDS:—by Charles Latimer. Presented by International Institute.

CONGRESSIONAL REPORT ON WEIGHTS AND MEASURES:—By Alex. Stephens. Presented by A. Townsend.

LETTER AND ACCOMPANYING DOCUMENTS:—by Secretary of Treasury on Metric System. Presented by J. S. Hilgard, U. S. N.

OUR REST:—Pyramid volume and current numbers. By J. S. Wilson.

Mr. Latimer also presented 100 copies of the Battle of the Standards on account of his subscription.

On motion of Mr. Shongo, the thanks of the Society were tendered the donors for their valuable and acceptable presents.

The Recording Secretary stated that the Society had been presented by Mr. Skinner with 200 copies of his interesting address recently delivered before the Society, and moved the following which was unanimously carried:

Resolved, That the thanks of the society be tendered J. R. Skinner, of Cincinnati, for his liberal gift of 200 copies of his valuable address on the British inch as used in the Great Pyramid.

Mr. Latimer presented the following which was carried with acclamation.

Resolved, That the thanks of this be tendered Prof. Piazz Smyth, of Edinburgh, Astronomer Royal of Scotland, for the honor he has done it by loaning for its use a magnificent scale of the Sacred cubit, beautifully graduated in British and Pyramid inches, showing the relation between them.

On motion of Mr. Wainwright, the address of Professor Thomas Wilson, delivered at the last meeting, was ordered to be published with the proceedings of the Society.

The following letter was then read by the Secretary :

CLEVELAND, April 26th, 1880.

MY DEAR SIR :—You must permit me to present my resignation as President of the Ohio Auxiliary Society, F. P. W. & M., if it can be said indeed that I have occupied such office. I address you in the matter because you know my reluctance at the beginning to have my name used in connection with the position, believing as I then said to you that has subsequently happened, viz: that my professional engagements and often absence from the city prevented me giving any or sufficient time to this work. I think I have been out of town at nearly every meeting of the Society from the first, and expect to be absent at the time of your next meeting. I thank the members who so unanimously honored me with the position and trust they have fully understood the reasons which have prevented my response to their call. At the same time I shall be glad to earnestly aid in every way consistent to maintain and hold fast the present standard of weights and measures of the United States through the workings of the society and personally.

Sincerely yours,

CHARLES LATIMER, Esq.,

J. H. DEVEREUX.

Mr. Devereux's resignation was accepted, and the office of President being vacant, Mr. Latimer was nominated. As no other nomination was offered the election of the nominee, in compliance with his request was deferred until the next meeting.

Mr. N. B. Wood then gave his experience, as an assayer, with the metric system. He stated that he had found it very inconvenient because of the difficulties of converting the French measures into grains and wholly inadequate for fine and minute measures. A member of the Society then gave the Hebrew origin of the word "inch" explaining its value in figures and letters.

Mr. Felix Rosenberg explained a beautiful coincidence he had discovered in certain figures used in a Hebrew prayer, which written in numerals, form 6561, an important figure in mathematical demonstrations.

Adjourned.

REGULAR MEETING,

May 12th, 1880.

In the absence of the Vice President, the Secretary called the meeting to order and nominated Mr. Latimer as Chairman, which was seconded and carried.

On taking the chair Mr. Latimer offered a brief prayer.

Minutes of last meeting were read and approved.

The chairman presented the following names as members, who on motion were duly elected.

Miss Augusta Barr, Mrs. E. P. Hutchinson. Miss Rosa Crampfort, Mr. Mathew Wright, Mr. W. H. McCurdy, Mr. E. B. Grover.

The next business in order was the election of President. Nominations were called for. Mr. Charles Latimer was named at the last meeting, no other nominations being made, on motion of Mr. Rosenberg, a formal ballot was dispensed with and Mr. Latimer was declared President by a rising and unanimous vote.

Mr. Latimer returned thanks for the honor done him, after which

he proceeded to address the meeting on the objects and intentions of the Society, with some remarks on the Sacred cubit and other measures found in the Great Pyramid.

Some remarks were then made as to the desirability of procuring a speaker, or essayists for each meeting, when the President volunteered to procure a lecturer for the next meeting, either Mr. Fish, of Chicago, or Mr. Skinner of Cincinnati.

On motion adjourned.

REGULAR MEETING,

May 26th, 1880.

Mr. J. F. Holloway being present, took the chair.

On motion, reading of the minutes was dispensed with.

Mr. A. S. Degg was presented for membership of the Society and duly elected.

The chair then introduced Mr. J. Ralston Skinner, of Cincinnati, who proceeded to address the Society on the "Antiquity of the modern British inch.

THE ANCIENT USE OF THE BRITISH MEASURES, OR THE PARKER MO- DULUS AND THE NEW ERA.

AN ADDRESS DELIVERED BEFORE THE OHIO AUXILIARY SOCIETY, MAY 26th, 1880, BY J. RALSTON SKINNER. COPYRIGHTED BY THE AUTHOR.

I have been asked to address this society upon subjects that are germane to its organization, and in consequence hope to present to your minds features of culture as germane to the work of the association which may take you a little by surprise. The immediate objects of this society are of the least possible importance when compared with the marvelous issues with which the measures which you uphold are essentially connected. These issues run off into utterly different fields of mental thought and investigation. The subject of measure merely is a very dry one, and by reason of the rigidity of the matter is and can be of itself of very little interest. So, too, the question of mere choice between the French metric and our old established modes of measure, is simple matter of convenience only, really refers itself to considerations again by reason of the baldness and rigidity and poverty of the subject, which can be easily and quickly enumerated, canvassed and judged of. To a person who has looked into the subject, especially a

practical man, such as an engineer, a carpenter, a draughtsman, a chemist, and so on, and who has once satisfied himself, there is but very little interest to be aroused in hearing mere repetitions of the same simple matters with which he is already so familiar. For this reason it is a matter of difficulty to hold such an organization as this together so long as new ingredients can be discovered as essentially appertaining to it which can and may supplement the dryness of its primal objects and infuse that kind of living vitality in it which will cause the association to thrive and increase on what it feeds on.

This has in some measure been accomplished by the somewhat startling, and certainly novel fact, that measures which the society upholds, i. e., the British have never been founded upon mere arbitrary choice of units of measure, but to the contrary take their origin upon an eternal geometrical truth, and have a history which reaches back in time, past all historical and legendary date. This evidences a civilization at that time, in some respects, far more advanced than ours—no matter from whence or where that civilization or the number of thousands of years required for its growth.

The evidences of this assertion are indisputable. We have them in our possession. They are open to, invite and challenge hostile criticism. Here before you is a representative of the great monumental witness of the great truth of what is asserted, viz: of the wonder of the world and the ages, the great Pyramid of Jeezeh. It can be called the great Pyramid of Adonai, or Jehovah, in Egypt; for, in fact, the word "Shopo," as used in the cartouche of the Pyramid is nothing more nor less than a form of the great Hebrew Tetragrammaton or four-letter word, "Jehovah" by means of a simple conversion of the Hebrew letters from one word to those of another under the cabalistic rule of Albam.

Here, indeed, is the bursting forth of a new mental world of thought and investigation.

So accurately can we reconstruct this great work, that we can discover the subtle interpretation of many lines, with the very mental conceptions of the architect, whoever that wonderful being was. We are not confined merely to the rough, dismantled monument on the

sterile sand plain of Memphis for the terminal resting place of our researches. Nor need we take into account, the so many, or so many thousands of years of age. No. We can bring back the living fact of architectural conception. It is as if Cuvier in finding a bone of an extinct species of animal—or Hugh Miller or Agassiz, of a fish—as if they had from this put together the whole wonderful lost work of a Divine Creative power, simply under, and by the law of constructive vital mechanism, guided by the idea of harmony, and symmetry of construction. Such an occupation must have made them reflect upon the thought and conception of the Creator.

Here, in this instance, we can pass back of the huge witness to its life spirit, that is, to the very mind, the very mental architectural idea in which it stood before that idea was clothed in stone. To me it is a most marvelous thing to know, viz: that we can even evoke the living thought from out the abyss of some thousands of years, from out the long past mouldering wrecks of races and nations.

I think perhaps it will afford you entertainment to give a short history of the development of the modulus of John A. Parker, as to the relation of diameter to circumference of circle in the numbers 6,561 to 20,612.

I had not the remotest idea at first that this form was in any way connected with measures. Nor, at first, had my acquaintance with this discovery aught whatever to do with the fact of some most marvelous astronomical measures derived with the utmost simplicity from his modulus. Thus: By a little simple mode of arithmetical calculation, based on his modulus, he finds the exact time of the moon about the earth. Then, by continuing a use of the last, by as simple a process, he finds the exact time of the earth around the sun. Again, he has a most simple form for obtaining the distance from the sun, which by a discovered mode of trial of my own for finding the angle of parallax and the distance, proves to be exact even to the closest measures of our day. He also discovered a mode of solution of the secular variation of the magnetic needle, by means of his modulus; which discovery should be sufficient to render his name famous, as it lays in an untried field of investigation, it is as meritorious, in my opinion, as

any original discovery which has ever been made in astronomical research.

Such results as these, with besides, some modes of pure geometrical discovery and reasoning which for beauty have never been exceeded forced me against all my prejudices of education to the admiration of his so-called second relation; that is, the relation of diameter to circumference of a circle. There were harmonies and symmetries connected with the use of his modulus, which rendered it far more difficult to conceive that he had merely invented it, or that it was an approximate, than that he had discovered an actual law which nature dealt with. And then came the question: Is it possible that nature herself deals in approximates of geometrical shapes in their numerical annotations? Is it possible that she is not as wise as Legendre and Playfair, who, in obtaining what they affirm to be the true relation, do so with a result that stands alone, as an irrational, incommensurable expression having nothing but the presentation of a *sur-dity* or rather *absurdity*, on its face? Is it so? And, after all, is nature obliged to use a relation which is an error to work out harmonies which forbid the idea of error? No. It could not be so. Thus I accept the Parker modulus for the very works sake. It has fortunately happened since then that I have found the problem of the rectification of the curve of the circle, by Legendre, to be a tissue of false showing with dust and glamour thrown around it. I say the problem of Legendre and Playfair can be fatally criticised.

When, afterward, I came into a new field of investigation, viz: the study of the pyramid, my first object was to put the structure together geometrically—without regard to any measure—taking as a type of structure the assertion of the Rev. John Taylor, that height was twice the base side as diameter to circumference of a circle. Parker's form with my belief in it, was just the thing for this use. I worked at this for a long time, until a sheer accident informed me that the Parker circumference of 20,612, taken as 20,612 British inches, or 1,7176 British feet, was of itself an *ancient cubic value*. So then, upon this fact of information, I was, wonderful to relate, dealing with geometrical form, which had a real measuring significance and use, among the nations of the earth! And that, too, in two kinds of meas-

ure, hitherto not dreamed of as being related to each other, viz: the British inch and foot and the old Egyptian cubit.

Afterward, I found a mode of getting a derivative from the Parker form by the proportion 20.612 : 6.561 : 64.8 : 20-6262647001x; by which I found I had made the restoration of two cubit measures in the same form and growing out of the same origin; and these I have since called, respectively, the Turin and Nilometer, cubit. The restorations were in terms of the British inch. With, them, finally, I was enabled to reconstruct the great Pyramid of Egypt, in terms of the very measures in British feet and inches, in which its various separated parts has been most carefully taken.

Here then, I had additional testimony of the strongest possible kind, of not only the truth of, but also of the vast importance of the Parker modulus. Let us array this additional testimony:

1. I found that the British measures were founded on it.
2. I found that the ancient and cubit values were founded on it.
3. I found that the Great Pyramid of Egypt was built by it; and
4. I afterward found that the ancient Roman foot was founded on it, though on the diameter of the modulus. 6.561 (diameter to 20.612)x16 9ths equal to 11.664 and 11.664 British inches is in fact the restoration of this Roman foot, as to which there are abundant authorities.

I may be somewhat mistaken as to the value of such testimony, but the effect now had become overwhelming in convincing me that the Parker relation of diameter to circumference of a circle was a true one—that one in which nature delighted, and with which she wrought in her own works in the cosmos. It seemed to me that this mighty array should have great weight when pitted against the mere assertion and *obiter dictum* of Legendre and Playfair, backed up alone by those distortions of true scientific inquiry, viz: those famous resolutions of the Academy of Science of Paris and the Royal Society of London. I say distortions of scientific enquiry because in all the realm of investigation, this one particular one, viz: of the rectification of the

curve of the circle is the only one on which these societies have fastened the gag against inquiry.

So the work of my friend John A. Parker, became very great and mighty in my estimation.

I come now to a development of this subject which must be approached with the most profound reverence—with awe—with fear and trembling, rather than with anything like flippancy, or any attempt or remotest permission to belittle. It is the use of this Parker modulus in the most ancient sacred books of the Bible itself. I can speak only of my own experience with regard to this book. I have made a study of it in one and another form of inquiry for many years. To me the book is superhuman, supernatural, full of divine inspiration, guidance, care and providence. I feel certain that a mighty spiritual power hedges this book around and about, and will preserve it against all attacks which may ever be made upon it. I have often, when excited by some wonder working in it coming to my recognition for the first time, said: This book must be a living entity. In fact, such is my present thought.

As regards the far east, we Western people are stupidly ignorant and obtuse as to any adequate conception of the subtle play and reach of the oriental mind and mode of allegorical and symbolical word use and picturing. I can illustrate this a little. An interpreter on the Western plains was telling the red chiefs of the wonderful powers of their white brothers in the East. The officer told him to tell the chiefs that a man in St. Louis could ask his friend in New Orleans what he had for breakfast and in fifteen minutes could get an answer. The interpreter said: "No, I will not tell them that, for I do not believe it myself." It is almost of no use to relate curious intricacies and exceed hinting subtleties of the Eastern people, on account of the difficulty the Western mind has to receive them. Much of the Holy Record which has the deepest and most awful significance may be presented to us in a guise which would repel us from its entertainment. The books of the Bible contain this subtlety of play to the last degree—and delight to conceal, even while most transparently simple. They contain all depths of learning, wisdom and knowledge fitted for the soul and spiritual wants of the poorest and the simplest

being—such a one, even, as Pollock describes, "who never had a dozen thoughts in all his life;" and yet, perhaps under cover of this very simplicity concealing a wealth of practical science which might mock the wise professor in all his self-complacency.

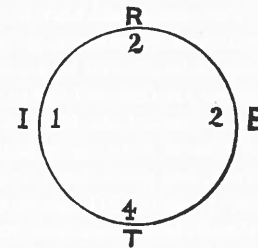
The books of the bible contain much in the way of parable, much assertion of fact that was never intended to be believed—much in the way of theology, astrology and astronomical figures; yet all this without damaging the book at all in its containment of a divine scheme for man's progressive development, betterment and final spiritual freedom and blessedness.

Having premised this, I can relate to you something of the extension of the search. My next step of discovery quickly stepped in upon that of the cubit value, and it was that in passing over from the Pyramid to the bible I found a manifest sameness of the measuaes there with those of the Pyramid itself. The step took its origin in this way: I sat at the window on one rainy Sunday, for the purpose of the study of the bible. It was an off day for work, and the Pyramid matters had been left Saturday night. Opening the book, my eye fell upon the passage, "And he built two pillars of brass." eighteen cubits was the height thereof. This set my mind to work at once, and the off day was forgotten. The occurrence startled the guest. You must know that with the Hebrews the books of the Bible are not of equal grade of holiness. The true book or THE book, is the Torah or the five books of Moses. This book it is which is so carefully written on the scrolls of the Synagogue. One other book is only of similar significance, through possibly of secondary importance, viz: the Book of Esther. The Temple as described in the Book of Kings and built after the pious desire of a man's heart, was not of the same sacred character as if it had been constructed by command of the Most High God for himself to dwell in. Thus I found that the Temple for its sacred character, rested upon a model, viz: the Tabernacle. Then I found various indications of structure, including the Ark of Noah and the Garden of Eden. I found to my satisfaction that the Temple was but a stone book, containing the wisdom of the Pyramid simply, under a different style of architecture. Thus it seemed that great value accompanied these various structures. They were diagram s

but where were the theorems of which these diagrams were the drawings? Evidently in the substance of the text, could it once be discerned. The reasoning turned out to be good, for at last the text gave up a portion at least of its mode of setting forth the use to be made of the diagrams. I think you can all of you imagine the thrill of excitement attending upon such a novel search, and upon at last a breaking forth of the fact. I can only described the sensation as a species of mental intoxication. Still the treasure was not given up at once, but slowly and in the very scantiest manner and measure. First one very bright light as that of a brilliant star; but it was so very far off, in a darkness such that no object was disclosed by it. Was there no other? And were there no connections to be made between such as were afterward proved, shining so brightly and yet so far away from one and each other? Imagine your chance of taking a butterfly, placed somewhere or anywhere between here and China, by searching for it in the dark! Still a dogged determination to search at any rate, finally was rewarded by more than I had ever dreamed of being vouchsafed me. Some few matters I can mention which will carry your minds on connectedly with the subject.

I found a manifest sameness of the cubit values in the Bible with those of the Pyramid. Thus, for instance, we will take the Ark of the Covenant, or the Ark of the Brith. Its measures are laid down as $2\frac{1}{2}$ cubits long, $1\frac{1}{2}$ cubits high, and $1\frac{1}{2}$ cubits broad. Let us take the Parker modulus and cubit value of 20,612 British inches. Then $2\frac{1}{2}$ cubits will prove to be 51.53 inches, and the height added to the breadth, or 3 cubits will prove to be 5.153 feet. There is the same peculiar number of 5153 in the denomination of feet and inches, yet significant of cubits. Now, the moral of this is, that 5153 is the base of the Parker modulus, because he starts with the fact that a square of 81 to the edge, and having consequently 6561 as its area will contain a circle whose area is 5153, or this very number. And then he says: If you change the use of these numbers from area to right line length, then a line which is 6561 long, as a diameter, will have a circumference as a circle of this 5153×4 equal to 20612, or the Parker modulus and cubit value. Here the evidence was of that peculiar nature which we call self-supporting. But the matter is not left thus to

itself, but is determined on as resting on this made of calculation, by peculiar contrivance of the words of the text, which mode is a familiar one in such matters. The Ark is qualified by being denominated the Ark of the Covenant, or Brith, and I could show you that the B'rith was the token of a circle. Here it is not only such, but the word itself will show you the value of the circle indicated, connecting it with these very numbers as used. The letters of the word are B-2 R-2(00) or to neglect any recognition of the ciphers I-10 or 1, and T-400 or 4. Put the small numbers of this word on the bounds of a circle as follows:



(th)

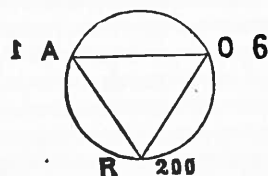
Now read these numbers around the circle; you read 4 and 1, and 2 and 2, and then to complete the circle you have to read again the 4; so that the full reading around the circle is 41224, which is the value of the circle of the B'rith. Now this is $5153 \times 8 = 41224$. One object of this is, if this 5153 is taken as the solid contents of a cube, it will take just eight of such to make another perfect cube which will have for its solid contents 41224 or the numerical value of this reading of the covenant.

Now we must bear in mind that this Ark of the Covenant was the chief content of the Tabernacle and there is no distinction whatever between the cubit values by which the one or the other was constructed. This being so the Tabernacle was 20 cubits long by 10 cubits broad, and these are the veritable measures of the Kings chamber in the Pyramid. The chamber has its coffer as the Tabernacle has its Ark.

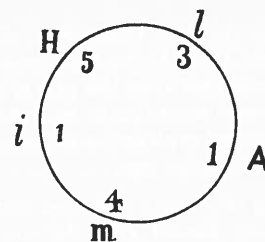
Both rooms are one room each, only the Tabernacle was divided by a curtain or veil.

I found the fact, again, thus: The length of the axial line of the Pyramid from the ground level to the intersection of the floor line of the Grand Gallery, is a constructive line of very great importance. It is eighty cubits long or high, and behold! I found that eighty cubits was the close and containment of the whole table of the Hebrew long measure, in what is technically called *the measuring line*.

After this I found full confirmation of the fact in a great variety of ways, but in one which is so notable, from its location in the very beginning of Genesis, that you should hear it. The great principal on which the entire system of measures used in the Bible is based, is to be found in the expression, "And God said let their be light." Here the significant words are God and light. The word light is in Hebrew A O R, and the values of the Hebrew letters are A—1, O—6 and R—200. It is a trilateral word, or triangular. Make a triangle with its points downward, and place the letters respectively at the corners of the triangle. Place this triangle in a circle, and then read the numbers around the circle and we have 200 and 6, or 206 and 1, and to complete the circle we must repeat the 2 of the 200 again, or in all 20612, or the Parker modulus, and 20612 inches is the cubit value. Here is the diagram.

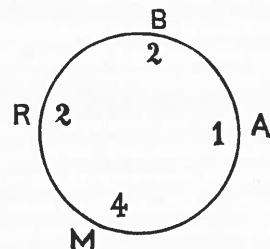


Thus it is geometrical, as showing the circumference of a circle, and it is a cubit measure as in British inches. Now place the word for God or Elhim upon the line of a circle, in the small numbers of the word, for it is permissible to neglect the ciphers, thus:



and the numbers are found to be so regularly arranged on this circle that we can read them directly as 3.1415; and this as you all can perceive, is what is called π value or circumference to a diameter of one. Here, then, we have the only integral relation of circumference of a circle and a use of it, such as to give an original straight line one. If the 20612 be taken in terms of inches, as it is for the cubit value, then this straight line is one inch, or in fact the primal measure issuing and originating out of the Parker form, announced thus here in Genesis.

Now this word Light or A O R is the self-same word with the name of the land out of which Abram came, that is, out of the Ur of the Chaldees. It is translated so as to read Ur, but it really is the word A O R. That is, Abram came out of A O R or light. We have seen that the word reads 20612 as the cubit value in British inches. Place the letters of the word Abram on the line of a circle and read the small values of the same, and its number can be read precisely the same as those of B. 'Rith, covenant or 41224, thus.



and indeed $20,612 \times 2 = 41,224$. The token of the covenant was placed on Abram. So, thus, Abram does come out of Ur, or A O R or Light. If we should pass upon this part of the record to the opening verses of the Gospel according to St. John, it would be found there is to be had a perfect explanation of them by reason of means that hertofore occultated philosophy.

These are among very many evidences that the Parker modulus was used in the Holy Record as at the very depth of the significations. I afterwards found that the Pyramid itself was being constructed in the progress of the narrative from Genesis through to the Tabernacle by marks and identifications and determinations, which were overwhelming to carry conviction. I found, moreover, that in the construction of the scrolls of the law exact measures are used, involving the cubit. I found there is a very curious reference to the workings of these numbers and measures in putting together of the verses and the letters and the words of the Pentateuch, or these five books of Moses. Thus there is no middle word in these books, but there are two middle words used, viz: Daresh Daresh, that is, "*Moses seeking sought.*" Now, these words read 324, 324; together they are 648, and, indeed, 64.8 is circumference to a diameter of our Nilometer cubit value—that one with which we construct our Pyramid, and the one to be found in the proportion which I have given, of 20,612, 6,561, 64.8: 20,62647001.

From this it is made to be seen that the words of the text are based on, and as it were, revolve around this derivative, prove the Parker modulus.

Here again we can marshal this additional testimony to the existence and use of this Parker modulus, and as seen, our witnesses becomes one of the most sublime character.

That a scientific system has developed in the Holy Record under cover of words, letters, numbers and narratives there in contained, gives a basis accounting for very many things which have unavailingly been commented upon. Let me premise by stating that there is another form of *Pi* value used, as resting on and subordinate to that of Mr. Parker, viz: 113.355.

The number of the men capable of bearing arms, representing the population which Moses led out of Egypt, has been much commented on, and especially by Bishop Colenso criticised. That number was 603,550. Now this number is necessary for the proper construction of the dwelling of the Lord in the Holy of Holies of the Tabernacle, and I could easily show you how the numbers were worked to construct that dwelling.

Again, very much sport and jest is made as to the account of the construction of the woman out of the rib of the man Adam. When the use is explained as merely, but most strangely and magically covering a Geometrical and numerical statement, the jest becomes lost in a species of amazement at the exceeding skill and subtlety of the mode of concealment, and of the rising of connected or related values at the base of a system.

So, too, the faith of the swallowing of the man by the fish is a mere means of making numerical permutations and changes under cloak of this mode.

Again, by this mode we can find an explanation by the use of symbols of the Dove and the Raven in the flood picture. They are used to portray the circle of the lunar year of 355 days crossed by 6 diameters of 113 each, or 678 divided by 6. The value of the word dove is 71. The word is used 5 times in the narrative, and $71 \times 5 = 355$, which is the Hebrew word *Shonah* or lunar year. The words "And the raven" are used as connected, and together are 678 or 113×6 . As 113 is diameter to the circumference of 355, then 6 of these diameters will divide the circle of 355 into 12 equal parts. It is this particular form of circle out of which is composed the dwelling of the Lord in the Tabernacle.

And so I could go on for quantity. Some of the most superb imagery to be found is that connected with the life of Moses at Mt. Sinai, where there is perfect and abundant explanation of many of those matters which have excited unending comment. So, perfect and beautiful explanations are to be had of how Moses was taken out of

the waters of the Nile River. Why he was taken out by Pharaoh's daughter—who she was and by what process he became her son by adoption.

The whole stupendous type of the entire Christian dispensation is to be found symbolized in the Garden of Eden.

But be these matters where and what they will, they all have to do with the unfolding of the use of exact science, as it has to do generally with astronomical applications.

So wonderful and prolific is the composition of these Hebrew books, that no myth of any moment of the ancient religions, but what was borrowed thence. The Atlas sustaining the world upon his shoulders, is no more nor less than anti-diluvian Iared, who is symbolically as with one foot on the sea and one foot upon dry land, with his uplifted outstretched hands upholding the vast expanse of the heavens. Nay, the bible itself is not lacking in mythical imagery; nor does this at all interfere with its quality of most perfect divine inspiration. Let us take a very beautiful instance. In the beginning of Genesis, God creates the evening, (that is sunset), and gives it the name of *Lilah*. Now, the letter Daleth, or D, in Hebrew is the symbol or picture of a door. If you prefix this letter to the word *Lilah* you have the word D'Lilah, or *Door of Darkness*, or of the evening. That is, she was the darkness into which the sun had to go at his setting, that is, she betrays the sun or entices him to fall. It would as you see, be to his ruin or death. When we refer to the word Sampson we find it to be a derivative from *Shemesh*, which means the sun. The year was at that time divided into the months of the sun, and of its absence. There were seven of the upper or sun months, and five of the winter. There was the evening of the year when the sun went down into the water, as well as the evening of the day when it went down into the darkness. Therefore, Sampson told D'Lilah if she wished to take away his strength, she could do so by cutting off the seven golden locks of his hair, and soon. That is, that when he came to Libra and went down into the bosom of sunset, or darkness of the night of the year that would be the waiving and cutting off his strength; his

seven months of vitality would have ended.

And so a far more beautiful conception because more prolonged is that upon which that great poem of Job is founded, and it is at its close that those characters are raised up whence the mystical idea of the three sisters, the three Parcae or Fates, took rise. You can see at once how lacking our poetic descriptive modes are in those singular ingredients of symbols and pictures, going to excite the mind and arouse and fasten the interest which those ancients possessed.

To what one thing more than all else, were those ancient holy poets and narrators indebted for a point of support for all their sublime structures? To nothing so much as the simple Parker Modulus. And why? Because it was the creative law of Almighty God, by which he mentally conceived the framework of the mighty worlds composing his house—that is, the universe. This little cube of 81 to the edge, with its contained sphere, with the measures thereof, was the model in his architectural rooms by which the Cosmos went forth. This and such was its value. As small as motes or gnats flying in the huge light of the sun of the heavens are men, compared with the comprehensible being who wrought these. Yet, as small as they are, he has designed to make them in the very image of himself. How? In physical form? That is perishable. No! In the living soul. But how, again? By putting them in possession of his own conceptive ideas as to the construction of the universe. And more, by leaving them a portion of his creative laws, that they could be used in man's workshop. And more than all else, as an abiding witness, by fashioning for them a unit of practical measure, which would co-ordinate material, sensible things with the divine harmony of his creative system. What was that law, and what was that measure?

The law was the Parker Modulus, and the measure was the

BRITISH INCH.

Such has been our array and marshalling of witnesses. But so far our witnesses have been mute monumental ones. Have we any living witnesses whose testimony can be compelled to the support of our cause? We have:

In older times, these matters of deep learning belonged to most secret orders of men, and the knowledge was hidden away in the depths of the arcana of these orders. Such orders prevailed over the world; or rather, one order prevailed over the world; for their was a common knowledge within the sacred precincts of the house of D'Lilah, or of Darkness, and from this there radiated out branches or stems, even to China and the remotest regions of the earth. But the Head was in Ur of the Chaldees, belonging properly to those sons of God, the Shemites or Hebrews. To them the Lord was Jehovah or Adonai, to the others the same, but under a prayer form. Thus the Baal form of Divine Lord was the image Dagon, or the Fishman, represented as a fish erected on his tail with a man's head projecting from his mouth. Now the Hebrew word for fish is NUN and the head of a man, that is of the Divine man was denoted by the letter *jod*. Place this head of the word NUN in the Hebrew characters and affix the number values. Under these, place equivalent letters and indeed you have the Hebrew word Jehovah, thus:

N U N I
5 6 5 10
H V H I

It was to this secret order among the Hebrews that this esoteric learning was delivered by the most guarded ways and means as the life post of the Divine records. From this head there branch off stems and these have gone on succeeding each other through the ages. With the Gentile or profane orders they had the shells and husks alone imparted to them, outward forms only, that is, that though permitted to belong to such order, yet as to the deep and vital learning or wisdom of the order these outside barbarians have been kept in the most profound ignorance. Thus it is that whoever advances upward in such a profane establishment sinks deeper in ignorance as he rises, as to any real knowledge which he had hoped to attain or been led to expect. Now, however, in the latter centuries there have been very many works written by members of these orders, on what is called their speculative philosophy, and in their own ignorance they have freely made public the very marks and signs by which the keys of their real esoterism of their orders can be had.

Whose fault is it then, if that which they have ignorantly published to the world should be given to the world? or that they themselves should be marshalled as witnesses of that which they themselves know not?

You must begin to see by this time that the witnesses to the old existence and use of the Parker Modulus are of the most stupendous character. They involve a department of learning notoriously pertaining to religion and to the adoration of the Supreme Being. Now, because the gist of this learning rests on a foundation of exact science it becomes evident that this adoration of God in some sort proceeded out of the development of this exact science; in other words, there was a time and a mode by which science and religion clasped hands, in which God became appreciable and realizable to man, irresistably through His works or manifestations. Now, we can call up still a final witness which serves to cover the very ground we seek. It is a philosophy which rests upon the very system of John A. Parker—which amplifies it—and which leads its applications directly to the Holy Books. The Jews have a philosophy which they term Cabbalah written in great obscurity, and covered up in the most bizarre and strongest style of enunciation. They themselves have lost the readings of their own books upon this subject. But a simple application of the Parker mode of geometric philosophy makes plain the very solution of it; and in such a systematical orderly way, that any one can see the true substance intended—I mean the deepest and most important solution.

The Jews have a little book of only ten or twelve leaves, purporting to be the Book of Creation, which was given by God to Adam. Besides this they have the Sohor (or light) and for Sohor its cognate word A O R can be used. These are the chief authorities. In commenting on the Book of Creation, or the Sepher Jetzirah, Moses Botril, an adept, exclaims that if Plato or Aristotle or any of the greatest philosophers could be brought to the acquaintance of the Divine Science resting therein, they would rejoice. But he could say no more than this, because as he alleges, he had no permission from his teachers.

It is said that when Moses received the law upon Mt. Sinai, besides the law he received oral teachings and explanations about the same, viz: the esoterisms thereof, and these were retained as the deepest arcania and were handed down, solely by oral tradition, to the most carefully selected few, with the very greatest caution and accuracy.

This delivery was called Cabbalah or Tradition. Happy be he, exclaims one, who through the labor of a long life, can glean a scintilla of this divine teaching. Of the substance of the Cabbalah, however, it is affirmed that the entirety of it is contained in the law itself. Its disclosures, then, in the Sacred Book, must after all be a means of the decyphering of the Cabbalah, covered as it is, in its manifold veils. There is much dispute as to the authenticity of the entire Cabbalistic system, and certainly as to the dates of authorship of these books, purporting to be very old. All hostile criticism must fall, however, if the substance of that system can be disclosed, and really to be found to be embedded in the layers of Holy Writ, as the fossils of past ages in the strata of the earth. Now with the requisite means, and a certain given direction that way, a solution is susceptible of being had of this cabbalah and its Biblical connection. I believe the chief data for the solution have been found, and already successfully applied, thus furnishing one more among the mighty instances to the vast importance of the Parker philosophy and modulus. Indeed one becomes appalled when he contemplates so amazing an array, and it fills one with a species of wondering expectation, as if some great Divine light, for so long withheld in the recesses of darkness, was about to burst forth upon the earth.

And now permit me to explain to you that no possible claim can be made to any extraordinary ability, or mental capacity, in the production of these discoveries. It may at a casual glance, seem to draw to it qualities somewhat above the average, which have evolved these decyphering from materials that have for so long defied all investigation and scrutiny, and have for so many ages hid themselves aloof from the knowledge of man and the glorious light of day. But let me illustrate the matter a little and you will see that no especial claim

save that only of patient research can be made in the whole range of these matters. Suppose a safe filled with treasure had some thousands of years ago been placed in the public square of some large city, with the free permission to all comers to open it and take possession of its contents. Suppose it had traced the aggregate of the highest mechanical skill of the world through centuries in vain. Now take it that a boy, or some poor fisherman, on the mighty bank, or in the sand of some stream, had accidentally uncovered an old key, which from some impulse he came to imagine would fit the wards of the lock of this safe. Suppose, on application he should find it to fit—to open the safe—and to entitle him, this less than average man, to take the treasure. You can see at once that it would not be in any way a surpassing intellect that opened the safe, though many generations of surpassing intellects had tried. John A. Parker found that key.

When, now in this whole regard, we reflect upon these matters—so utterly novel and strange to the whole world—dropped as they have been, out of the very heavens, unheralded and suddenly; involving as they do, such mighty interests; calling forth out of the darkness of night and concealment the very center and core of systems which are notoriously of a Divine religious claim. When, in addition, a something of promise has constantly projected itself forward from the midst of the Holy Record, offering to many at the time of the end of certain cycles, disclosures to proceed from the Divine Custodian, for the good of man.

Since this is so, and since all the signs of the times, show that we are at the close of an old and dawn of new era. While those students of Holy Writ claim that the very limit of the cycles of promise have come, then, indeed is it strange, that the mind is lead to dwell in a kind of an expectancy of good to come out of these discoveries.

Let me close with directing your attention to two great culminating data, fixed or fastened on to the close of the end, as perhaps, determinations of what may be expected as the condition of that which is so popularly called the second coming, or by the old Hebrew

records, the close of the end. In Revelations the last rider, the one going forth conquering and to conquer, he who is to possess all crowns and principalities, has as all his predecessors had, a sword, but unlike all others, the sword proceeds out of his mouth.

Is not the anthropomorphic idea one implying that knowledge, and a mode of educating men, is to be sent down from on high?

So David himself, the old Hebrew sage, says of that very time: "There shall be running to and fro over the earth and knowledge shall be increased." It shall be the day when the Jew and Gentile shall come together in the utmost harmony of agreement, when there shall be one Lord over all and His name shall be ONE.

This address was listened to with great interest by a large and appreciative audience, and at its close, on motion of Mr. Blackburn, the thanks of the Society were tendered Mr. Skinner for his able and interesting address.

The Society then adjourned.

REGULAR MEETING,

June 9th, 1880.

President Latimer on taking the chair opened the meeting as usual with a brief prayer.

The Secretary being absent, Mr. J. Wainright was on motion made Secretary *pro tem*.

On motion of Mr. Latimer, H. M. Grout was elected a member of the Society.

The President stated that a number of copies had been presented to the Society by Mr. J. R. Skinner, of his late address on the "Ancient use of the British Measure." On motion the thanks of the Society were tendered the author for the same.

A brief discussion of Mr. Skinner's paper then followed. After which the Society adjourned.

REGULAR MEETING,

June 23, 1880.

President Latimer before taking the chair, offered, as usual, a brief prayer.

In the absence of the Recording Secretary, Mr. John Wainright was requested to act as Secretary.

On motion Dr. J. Newcomer, Mr. John Vial and Mr. H. M. Addison were elected members of the Society.

The President read interesting letters from Dr. Pancoast, of Philadelphia and Prof. Piazzzi Smyth, Astronomer Royal of Scotland endorsing the work of the Society.

On motion Messrs Wainright, Rawson and Rosenberg, were appointed to aid the Recording Secretary in the publication of the transactions of the Society, with full power to act.

Mr. F. Rosenberg made a brief address upon the numerical values and meanings of the letters of the Hebrew alphabet, fully confirming the statement of Mr. Skinner, Mr. Wilson, and others.

A most interesting conversation then followed, in which Messrs Wainright, Newcomer, Latimer, Rosenberg, and others took part.

Mr. Rosenberg showed that the Hebrew word *Ancakot* mentioned in the construction of the Tabernacle of Moses, was a measure, and had the numerical value, in Hebrew of 6661. Also that Archetypal man in the *Cabala*, likewise contained the same numerical value.

The President stated that the subject under discussion covered what is known as the *Cabala*, "The Secret Wisdom of the Scripture," said to be divided into three great heads, *The Gematrie*, *No-taricon* and *Themurah*, and these subdivided into other three, each covering Geometry, Astronomy, Arithmetic and kindred sciences, into which the Society now proposes to dig, and bring to the surface whatever may be relevant to our weights and measures, and incidentally to whatever may relate to other branches of this important subject.

Adjourned.

REGULAR MEETING,

July 7th, 1880.

President Latimer in the Chair, who opened the meeting with prayer.

The proceedinds of the last meeting were read and approved.

The President made some remarks on the objects and purposes of the Society, claiming that *truth* was the object sought and that neither the Society nor any of its members had any hobbies to ride, or preconceived theories to work out. Instruction and knowledge of the past were the principle incentives to action.

Mr. Davies from Committee on publication made a verbal report of the progress making in publishing the Transactions of the Society.

The President then introduced Dr. Ep W. Epstein, of Tiffin, O., who proceeded to address the Society on what he termed

ISRAELS NOMADIC ARCHITECTURE.

especially as it relates to the construction of the Tabernacle.*

On conclusion of Dr. Epstein's address, a vote of thanks was tendered by the large and appreciative audience present.

Adjourned.

REGULAR MEETING,

July 21, 1880.

President Latimer opened the meeting, as usual with prayer.

Mr. Davies from Publication Committee, reported the printing of the Society Proceedings as progressing satisfactorily.

On motion Mr. Geo. Kelley, Dr. J. Wylie Smith, Mr. J. W. Richardson and Dr. E. M. Epstein, of Tiffin, were elected members of the Society.

*A full report of this most interesting address will be found in the appendix.

Mr. Latimer presented for examination an elaborate chart of the Great Pyramid for the use of Sunday Schools, prepared by Mr. Lucian I. Bisbee, Secretary of the International Institute of Boston.

Mr. John Vial read a paper on the cubit. In this paper Mr. Vial took 20,625 inches as the proper cubit, and as the one used by engineers, road-makers, masons and land-measurers. At the conclusion of the paper it was discussed for a short time, and during the discussion attention was called to Dr. Epstein's paper on the construction of the tabernacle by the Israelites. Mr. J. Wainright went over the substance of the paper and an interesting discussion followed.

Mr. Latimer presented a copy of the *Medical Annals* of Albany N. Y., with an article entitled: "Shall we Indorse the Metric System." with a brief sketch of the history of the movement for its introduction into this country, concluding with the significant statement that "the editors of the Annals at present are unwilling to abandon the old system."

The President also read from the proceedings of the Connecticut Medical Society of the 26th of May, 1880, refusing to recommend the use of the metric system by the medical men and druggists of Connecticut.

Adjourned.

APPENDIX.

MEASURES IN BRITISH INCHES OF THE COFFER IN THE KING'S CHAMBER
OF THE EGYPTIAN PYRAMID OF JIZEH.

Parker form of diameter to circumference of a circle 6561 to 20612
From this we can take the proportion

$$20\ 612 : 6\ 561 \text{ as } 64\ 8 : 20.62647001x$$

Call these terms *British inches*, and in the first and fourth terms we have the ancient *royal cubits*, so called; by which cubits the Great Pyramid was constructed in all its parts

Take the third and fourth terms as 648 to 206.2647001x inches; divide by 24, and we have

$$(1), 27 \text{ to } (2), 8.594362x \text{ inches.}$$

(1), or 27 inches is the inside width of the Coffin. The wall of the Coffin is 6 inches thick, therefore $6 \times 2 = 12$ inches added to 27 inches equals 39 inches, the outside width of the Coffin, 39 inches multiplied by 2 equals 78 inches, which equals the inside length of Coffin.

Multiply (2) or 8.5943625x inches by 4, and we have 34.3774500x inches, or inside height of Coffin. This, in the scale of inches for feet is the length of the King's Chamber. Multiply 34.3774500x inches by 12-10, or 20.62647001x inches by 2, and we have, 41.25294002x

inches, which is the outside height of Coffor. 412.529^x inches is the length of King's Chamber.

So we have

Inside width, 27.	inches.
Inside length, 78.	inches.
Inside height, 34.3774500^x	inches.
Outside width, 39.	inches.
Outside length, 90.	inches.
Outside height, 41.252940^x	inches.

Cubic contents of inside of Coffor, 72398.9997612846^x inches. Multiply this by 2, and we have the cubic contents of the outside measures, or

144797.81952256920^x inches.

These measures compare with, and explain or interpret Piazzini Smyth's actual measures of this coffor.

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A REPORT

TO

U. S. HOUSE OF REPRESENTATIVES

ON

measures + Measures, Weights and Coins,

BY

. THOMAS JEFFERSON, 1743-1826

Secretary of State.

JULY 4th, 1790.

NEW YORK, July 4th, 1790.

Sir:—In obedience to the order of the House of Representatives of January 15th, I have now the honor to enclose you a Report on the subject of MEASURES, WEIGHTS and COINS. The length of time which intervened between the date of the order and my arrival in this city, prevented my receiving it till the 15th of April; and illness which followed soon after, added, unavoidably, some weeks to the delay; so that it was not till about the 20th of May that I was able to finish the Report. A desire to lessen the number of its imperfections, induced me still to withhold it awhile, till, on the 15th of June, came to my hands, from Paris, a printed copy of a proposition made by the Bishop of AUTUN, to the National Assembly of France, on the subject of Weights and Measures; and three days afterwards I received through the channel of the public papers, the speech of Sir JOHN RIGGS MILLER, of April the 13th, in the British House of Commons, on the same subject. In the Report which I had prepared, and was then about to give in, I had proposed the latitude of 38° , as that which should fix our standard, because it was the medium latitude of the United States; but the proposition before the National Assembly of France, to take that of 45° as being a middle term between the Equator and both Poles, and a term which might consequently unite the nations of both hemispheres, appeared to me so well chosen, and so just, that I did not hesitate a moment to prefer it to that of 38° . It became necessary of course to reform all my calculations to that standard; an operation which has been retarded by my other occupations.

These circumstances will, I hope, apologize for the delay which has attended the execution of the order of the House: And perhaps, a disposition on their part, to have due regard to the proceedings of other nations, engaged on the same subject, may induce them still to defer deciding ultimately on it till their next session. Should this be the case, and should any new matter occur in the mean time I shall think it my duty to communicate it to the House, as supplemental to the present Report.

I have the Honor to be.

With Sentiments of the most profound Respect,

SIR,

Your most obedient, and

Most humble Servant,

THOMAS JEFFERSON.

To the Speaker of the House of Representatives.

IN THE HOUSE OF REPRESENTATIVES OF THE UNITED STATES.

FRIDAY, the 15th of January, 1790.

ORDERED,

That it be referred to the Secretary of State to prepare and report to this House a proper Plan or Plans for establishing Uniformity in the Currency, Weights and Measures of the United States.

Extract from the Journal,

JOHN BECKLEY, Clerk.

The Secretary of State, to whom was referred, by the House of Representatives, to prepare and report a proper Plan or Plans for establishing Uniformity in the Currency, Weights and Measures of the United States, in obedience thereto, makes the following

REPORT.

To obtain uniformity in Measures, Weights and Coins, it is necessary to find some measure of invariable length, with which, as a standard, they may be compared.

There exists not in nature, as far as has been hitherto observed, a single subject, or species of subject, accessible to man, which presents one constant and uniform dimension.

The globe of the earth itself, indeed, might be considered as invariable in all its dimensions, and that its circumference would furnish an invariable measure; but no one of its circles, great or small, is accessible to admeasurement through all its parts, and the various trials to measure definite portions of them, have been of such various result, as to show there is no dependence on that operation for certainty.

Matter then, by its mere extension, furnishing nothing invariable its motiou is the only remaining resource.

The motion of the earth around its axis, though not absolutely uniform and invariable, may be considered as such for every human purpose. It is measured obviously, but unequally, by the departure of a given meridian from the sun and its return to it, constituting a solar day. Throwing together the inequalities of solar days, a mean interval, or day, has been found, and divided, by very general consent, into 86,400 equal parts.

A pendulum vibrating freely, in small and equal arcs, may be so adjusted in its length, as, by its vibrations, to make this division of the earth's motion into 86,400 equal parts, called seconds of mean time.

Such a problem then, becomes itself a measure of determined length, to which all others may be referred, as to a standard.

But even the Pendulum is not without its uncertainties.

1. The difficulty of ascertaining in practice its center of oscillation, as depending on the form of the bob, and its distance from the point of suspension; the effect of the weight of the suspending wire towards displacing the center of oscillation; that center being seated within the body of the bob, and, therefore, inaccessible to the measure, are sources of considerable uncertainty.

2. Both theory and experience prove, that to preserve its isochronism, it must be shorter towards the equator, and longer towards the poles.

3. The height of the situation above the common level, as being an increment to the radius of the earth, diminishes the length of the Pendulum.

4. The Pendulum being made of metal, as is best, it varies its length with the variations in the temperature of the atmosphere.

5. To continue small and equal vibrations, through a sufficient length of time, and to count these vibrations, machinery and a power are necessary, which may exert a small but constant effort to renew the waste of motion: And the difficulty is, so to apply these, as that they shall neither retard nor accelerate the vibrations.

1. In order to avoid the uncertainties which respect the center of oscillation, it has been proposed by Mr. Leslie, an ingenious artist of Philadelphia, to substitute, for the pendulum, an uniform cylindrical rod, without a bob.

Could the diameter of such a bob be infinitely small, the center of oscillation would be exactly at two-thirds of the whole length, measured from the point of suspension. Giving it a diameter which shall render it sufficiently inflexible, the center will be displaced, indeed; but, in a second rod not the $\frac{1}{600,000}$ part of its length, and not the hundredth part as much as in a second Pendulum, with a spherical bob of proper diameter. This displacement is so infinitely

minute then, that we may consider the center of oscillation, for all practical purposes, as residing at two-thirds of the length, from the center of suspension. The distance between these two centers might be easily and accurately ascertained in practice. But the whole rod is better for a standard, than any portion of it, because sensibly defined at both its extremities.

2. The uncertainty arising from the difference of length requisite for the second Pendulum, or the second rod, in different latitudes may be avoided by fixing some one latitude, to which our standard shall refer. That of 38° , as being the middle latitude of the United States, might seem the most convenient, were we to consider ourselves alone; but connected with other nations by commerce and science, it is better to fix on that parallel which bids fairest to be adopted by them also. The 45th as being the middle term between the equator and pole has been heretofore proposed in Europe; and the proposition has been lately renewed there, under circumstances which may very possibly give it some effect. This parallel is distinguished with us also, as forming our principal Northern Boundary. Let the completion of the 45th degree then give the standard for our union, with the hope that it may become a line of union with the rest of the world.

The difference between the second rod for 45° of latitude, and that for 31° our other extreme is to be examined.

The second pendulum for 45° of latitude, according to Sir Isaac Newton's computation, must be of [2] 39.14912 inches English measure; and a rod to vibrate in the same time, must be of the same length between the centers of suspension and of oscillation, and frequently, its whole length 58.7 [or more exactly 58.72368] inches. This is longer than the rod which shall vibrate seconds in 21° of latitude, by about $\frac{1}{679}$ part of its whole length; a difference so minute that it might be neglected, as insensible, for the common purposes of life: But in cases requiring perfect exactness, the second rod, found by trial of its vibrations in any part of the United States may be corrected by computation for the (3) latitude of the place, and so brought exactly to the standard of 45° .

3. By making the experiment in the level of the ocean, the difference will be avoided, which a higher position might occasion.

4. The expansion and contraction of the rod with the change of temperature is the fourth source of uncertainty before mentioned. According to the high authority so often quoted, an iron rod, of given length, may vary, between summer and winter, in temperate latitudes and in the common exposure of house clocks, from 1-1728 to 1-2592 of its whole length, which, in a rod of 58.7 inches, will be from about two, to three hundredths of an inch. This may be avoided by adjusting and preserving the standard in a cellar, or other place, the temperature of which never varies. Iron is named for this purpose because the least expansible of the metals.

5. The practical difficulty resulting from the effect of the machinery and moving power, is very inconsiderable in the present state of the arts; and in their progress towards perfection, will become less and less. To estimate and obviate this, will be the artists province. It is as nothing when compared with the sources of inaccuracy hitherto attending mensures.

Before quitting the subject of the inconveniences, some of which attend the pendulum alone, others, both the pendulum and rod it must be added that the rod would have an accidental, but very precious advantage over the pendulum in this country, in the event of our fixing the foot as the nearest aliquot part of either; for the difference between the common foot and those so to be deduced, would be three times greater in the case of the pendulum, than that of the rod.

Let the standard of measure then be an uniform cylindrical rod of iron, of such length, as in latitude 45° in the level of the ocean, and in a cellar, or other place, the temperature of which does not vary through the year, shall perform its vibrations, in small and equal arcs, in one second of mean time.

A standard of invariable length being thus obtained, we may proceed to identify, by that, the Measures, Weights and Coins of the United States: But here a doubt presents itself, as the extent of the reformation meditated by the House of Representatives. The exper-

iment made by Congress in the year 1786, by declaring that there should be one money of account and payment through the United States, and that its parts and multiples should be in a decimal ratio, has obtained such general approbation, both at home and abroad, that nothing seems wanting, but the actual coinage, to banish the discordant pounds, shillings, pence and farthings of the different states, and to establish in their stead, the new denominations. Is it in contemplation with the House of Representatives to extend a like improvement to our Measures and weights and to arrange them also in a decimal ratio? The facility which this would introduce into the vulgar arithmetic, would unquestionably, be soon and sensibly felt by the whole mass of the people, who would thereby be enabled to compute for themselves whatever they should have occasion to buy, to sell or to measure, which the present complicated and difficult ratios place beyond their computation, for the most part. Or, is it the opinion of the Representatives that the difficulty of changing the established habits of a whole nation opposes an insuperable bar to this improvement? Under this uncertainty the Secretary of State thinks it his duty to submit alternative plans, that the House may, at their will, adopt either the one or the other, exclusively, or the one for the present, and the other for a future time, when the public mind may be supposed to have become familiarized to it.

I.

And first, on supposition that the present Measures and Weights are to be retained, but to be rendered uniform and invariable, by bringing them to the same invariable standard.

The first settlers of these States, having come chiefly from England, brought with them the measures and weights of that country. These alone are generally established among us, either by law or usage and these, therefore, are alone to be retained and fixed. We must resort to that country for information of what they are, or ought to be.

This rests principally on the evidence of certain standard meas-

ures and weights, which have been preserved of long time in different deposits. But difference among these have been known to exist, the House of Commons, in the years 1757 and 1758, appointed Committees to enquire into the original standards of their Weights and Measures. These Committees, assisted by able mathematicians, and artists, examined and compared with each other, the several Standard Measures and weights, and made reports on them in the years 1758 and 1759. The circumstances under which these reports were made, entitle them to be considered, as far as they go, as the best written testimony existing, of the standard measures and weights of England; and as such, they will be relied on in the progress of this report.

MEASURES OF LENGTH.

The Measures of Length in use among us are :

- The League of 3 miles;
- The Mile of 8 furlongs;
- The Furlong of 40 poles or perches;
- The Pole or Perch of $5\frac{1}{2}$ yards;
- The Fathom of 2 yards;
- The Ell of a yard and quarter;
- The Yard of 3 feet;
- The Foot of 12 inches;
- And the Inch of 10 Lines.

On this branch of their subject the Committee of 1757, 1758, says that the standard measures of length at the receipt of the Exchequer, are a yard, supposed to be of the time of H. 7. and a yard and ell supposed to have been made about the year 1601, that they are brass rods, very coarsely made, their divisions not exact, and the rods bent: and that in the year 1742, some members of the Royal Society had been at great pains in taking an exact measure of these standards, by very curious instruments, prepared by the ingenious Mr. Graham, that the Royal Society had had a brass rod made pursuant to their experiments, which was made so accurately, and by persons so skil-

ful and exact, that it was thought not easy to obtain a more exact one and the Committee in fact found it to agree with the standards at the Exchequer, as near as it was possible. They furnish no means, to persons at a distance, of knowing what this standard is. This however is supplied by the evidence of the second pendulum, which according to the authority before quoted, is, at London, 39.1682 English inches, and consequently, the second rod, there, is of 58.7523 of the same inches. When we shall have found, then, by actual trial, the second rod for 45° by adding the difference of their computed length to wit: $287.10,000$ of an inch, or rather 3.10 of a line [which in practice will endanger less error, than an attempt at so minute a fraction as the ten-thousandth parts of an inch] we shall have second rod of London, or a true measure of $58\frac{3}{4}$ English inches. Or, to shorten the operation, without varying the result,

Let the standard rod of 45° be divided into $587\frac{1}{2}$ equal parts and let each of these parts be declared a line.

- 10 Lines an inch;
- 12 Inches a foot;
- 3 Feet a yard;
- 3 Feet 9 Inches an Ell;
- 6 Feet a Fathom;
- $5\frac{1}{2}$ Yards a perch or pole;
- 40 Poles or Perches a furlong;
- 8 Furlongs a mile;
- 3 Miles a League.

SUPERFICIAL MEASURES.

Our measures of surface are the Acre of 4 rood; and the Rood of 40 square poles; so established by a statute of 33 E. 1. Let them remain the same.

MEASURES OF CAPACITY.

The measures of Capacity in use among us are of the following names and proportions.

The gill, 4 of which make a quart;

2 Pints make a quart;

2 Quarts a pottle;

2 Pottles a gallon;

2 Gallons a peck, dry measure;

8 Gallons make a measure called a firkin, in liquid substance, and a bushel dry;

2 Firkins or bushels, make a measure called a rundlet, or kilderkin, liquid and a strike, dry.

2 Kilderkins, or strikes makes a measure called a barrel, liquid, and a coomb, dry; this last term being ancient and little used.

2 Barrels or coombs make a measure called a hogshead, liquid, or a quarter, dry; each being the quarter of a ton;

A Hogshead and a third make a tierce, or third of a ton;

2 Hogsheads make a pipe, butt, or puceon.

And 2 Pipes make a ton.

But no one of these measures is of a determinate capacity. The report of the committee of 1757—8 shews that the gallon is of very various content: and that being the unit, all the others must vary with it.

The Gallon and Bushel contain:

224 and 1792 cubic inches, according to the standard wine gallon preserved at Guildhall.

231 and 1848, according to the statute of the 5th Anne.

264.8 and 2118.4 according to the ancient Rumford quart of 1228 examined by the committee.

265.5 and 2124, according to three standard bushels preserved in the Exchequer, to wit, one of H. 7. without a rim, one dated 1091 supposed for 1591, or 1601, and one dated 1601.

266.25 and 2130 according to the ancient Rumford gallon of 1228 examined by the committee.

268.75 and 2150 according to the Winchester bushel, as declared by statute 13. 14. W. 3, which has been the model for some of the grain states.

271. less two spoonfuls, and 2168, less 16 spoonfuls, according to a standard gallon of H. 7. and another dated 1601, marked E. E. both in the Exchequer.

271 and 2168, according to a standard gallon in the Exchequer dated 1601, marked E and called the corn-gallon.

272 and 2176, according to the three standard corn-gallons last mentioned, as measured in 1688, by an artist for the Commissioners of the Excise, generally used in the seaport towns and by mercantile people, and hence introduced into some of the grain states.

277 18 and 2217.44, as established for the measure of coal by the statute 12 Anne.

278, and 2224, according to a standard bushel of H. 7. with a copper rim, in the Exchequer.

278.4 and 2227.2 according to two standard pints of 1601, and 1602, in the Exchequer.

280, and 2240, according to the standard quart of 1601, in the Exchequer.

282, and 2256, according to the standard gallon for beer and ale, in the Treasury.

There are moreover, varieties on these varieties, from the barrel to the ton inclusive: for, if the barrel be of herrings, it must contain 28 gallons by the statute 13. El. c. 11. If of wine, it must contain $31\frac{1}{2}$ gallons by the Statute 2. H. 6. c. 11. and 1. R. 3. c. 15. If of beer or ale, it must contain 34 gallons by the statute 1. W. and M. c. 24. and the higher measures in proportion.

In those of the United States which have not adopted the statutes of W. and M. and of Anne before cited, nor their substance, the wine

of 231 cubic inches rests on the authority of very long usage before the 5th. of Anne, the origin and foundation of which are unknown; the bushel is the Winchester bushel, by the 11. H. 7. undefined; and the barrel of ale 32 gallons, and of beer 36 gallons by the statute 23 H. 8. c. 4.

The Secretary of State is not informed whether there have been any and what alterations of these measures, by the laws of the particular States.

It is proposed to retain this series of measures, but to fix the gallon to one determinate capacity, as the unit of measure, both wet and dry; for convenience is in favor of abolishing the distinction between wet and dry measures.

The wine gallon, whether of 224 or 231 cubic inches, may be altogether disregarded, as concerning, principally, the mercantile, and the wealthy, the least numerous part of the society, and the most capable of reducing one measure to another by calculation. This gallon is little used among the mass of farmers, whose chief habits and interests are in the size of the corn bushel.

Of the standard measures before stated, two are principally distinguished in authority and practice. The statute bushel of 2150 cubic inches, which gives a gallon of 268 75 cubic inches, and the standard gallon of 1601, called the corn gallon of 271, or 272 cubic inches, which has introduced the mercantile bushel of 2176 inches. The former of these is most used in some of the grain states, the latter in others. The middle term of 270 cubic inches may be taken as a mutual compromise of convenience, and as offering this general advantage, that the bushel being of 2160 cubic inches, is exactly a cubic foot and a quarter, and so facilitates the conversion of wet and dry measures into solid contents and tonnage, and simplifies the connection of measures and weights, as will be shewn hereafter. It may be added in favor of this, as a medium measure, that eight of the standard or statute measures before enumerated, are below this term, and nine above it.

The measures to be made for use, being four-sided, with rectangular sides and bottom,

The Pint will be 3 inches square and $3\frac{3}{4}$ inches deep;

The Quart 3 inches square and $7\frac{1}{2}$ inches deep;

The Pottle 3 inches square and 15 inches deep, or $4\frac{1}{2}$, 5 and 6 inches;

The Gallon 6 inches square and $7\frac{1}{2}$ inches deep, or 5, 6 and 9 inches;

The Peck 6, 9 and 10 inches;

The Half-bushel 12 inches square, and $7\frac{1}{2}$ inches deep; and

The bushel 12 inches square, and 15 inches deep, or 9, 15 and 16 inches.

Cylindrical measures have the advantage of superior strength; but square ones have the greater advantage of enabling every one, who has a rule in his pocket, to verify their contents, by measuring them. Moreover, till the circle can be squared, the cylinder cannot be cubed, nor its contents exactly expressed in figures.

Let the measure of capacity then, for the United States, be,

A Gallon of 270 cubic inches;

The Gallon to contain two pottles;

The Pottle 2 quarts;

The Quart 2 pints;

The Pint 4 gills;

2 Gallons to make a peck;

8 Gallons a bushel or firkin;

2 Bushels or firkins, a strike or kilderkin;

2 Strikes, or kilderkins a coomb, or barrel;

2 Coombs, or barrels a quarter or hogshead;

A Hogshead and a third, one tierce;

2 Hogsheads a pipe, butt or puncheon; and

2 Pipes a ton.

And let all the measures of capacity of dry subjects be stricken with a strait strike.

WEIGHTS.

There are two series of Weights in use among us; the one called Avoirdupois, the other Troy.

In the Avoirdupois series,

The Pound is divided into 16 ounces;

The Ounce into 16 drams;

The Dram into 4 quarters.

In the Troy series,

The Pound is divided into 12 ounces;

The Ounce (according to the subdivision of the Apothecaries) into 8 drams;

The dram into 3 scruples;

The Scruple into 20 grains.

According to the subdivision for gold and silver, the ounce is divided into 20 penny-weights; and the penny-weight into 24 grains.

So that the pound Troy contains 5760 grains, of which, 7,000 are requisite to make the pound Avoirdupois; of course the weight of the pound Troy, is to that of the pound Avoirdupois as 5760 to 7,000, or, 144 to 175.

It is remarkable that this is exactly the proportion of the ancient liquid gallon of Guidhall of 224 cubic inches, to the corn gallon of 272, for 224 are to 272, as 144 to 175. (4.)

It is further remarkable still, that this is also the exact proportion between the specific weight of any measure of wheat, and of the same measure of water. For the statute bushel is of 64 pounds of wheat. Now as 144 to 175, so are 64lb. to 77.7lb. but 77.7lb. is known to be the weight of (5.) 2150.4 cubic inches of pure water; which is exactly the content of the Winchester bushel, as declared by the statute 13. 14 W. 3. That statute determined the bushel to be a cylinder of 18½ inches diameter, and 8 inches depth. Such a cylinder, as nearly as can be cubed, and expressed in figures, contains 2150 425 cubic inches; a result which reflects authority on the declaration of Parlia-

ment, and induces a favorable opinion of the care with which they investigated the contents of the ancient bushel, and also a belief that there might exist evidence of it at that day, unknown to the committees of 1758 and 1759.

We find then in a continued proportion 64 to 77.7 as 224 to 272, and as 144 to 175, that is to say, the specific weight of a measure of wheat, to that of the same measure of water, as the cubic contents of the wet gallon, to those of the dry; and as the weight of a pound Troy to that of a pound Avoirdupois.

This seems to have been so combined as to render it indifferent whether a thing were dealt out by weight or measure, for the dry gallon of wheat, and the liquid one of wine were of the same weight; and the Avoirdupois pound of wheat, and the Troy pound of wine, were of the same measure. Water and the vinous liquors which enter most into commerce, are so nearly of a weight, that the difference, in moderate quantities, would be neglected by both buyer and seller; some of the wines being a little heavier, and some a little lighter than water.

Another remarkable correspondence, is that between weights and solid measures. For 1000 ounces Avoirdupois of pure water, fill a cubic foot, with mathematical exactness.

What circumstances of the times or purposes of barter, or commerce, called for this combination of weights and measures, with the subjects to be exchanged or purchased, are not now to be ascertained. But a triple set of exact proportionals representing weights, measures and the things to be weighed and measured, and a relation so integral between weights and solid measures, must have been the result of design and scientific calculation, and not a mere coincidence of hazard. It proves that the dry, and wet measures, the heavy and light weights must have been original parts of the system they compose, contrary to the opinion of the committee of 1757—1758, who thought that the Avoirdupois weight was not an ancient weight of the kingdom, nor ever, even a legal weight, but during a single year of the reign of H. 8. and therefore, concluded, otherwise than will be here proposed, to suppress it altogether. Their opinion was founded chiefly on the

silence of the laws, as to this weight. But the harmony here developed in the system of weights and measures of which the Avoirdupois makes an essential member, corroborated by a general use from very high antiquity, of that, or of a nearly similar weight under another (6) name form stronger proofs that this is a legal weight than the mere silence of the written laws is of the contrary.

Be this as it may. it is in such general use with us that on the principle of popular convenience its higher denominations at least be preserved. It is by the Avoirdupois pound and ounce that our citizens have been used to buy and sell. But the familiar subdivisions of drams and quarters, are not in use with them. On the other hand they have been used to weigh their money and medicine with the penny-weights and grains troy-weight, and are not in the habit of using the pounds and ounces of that series. It would be for their convenience, then, to suppress the pound and ounce troy, and the dram and quarter Avoirdupois; and to form into one series the Avoirdupois pound and ounce and the Troy penny-weight and grain. The Avoirdupois ounce contains 18 penny-weight $5\frac{1}{2}$ grains troy-weight. Divide it then into 18 penny-weights, and the penny-weight, as heretofore, into 24 grains, and the new penny-weight will contain between a third and a quarter of a grain more than the present troy penny-weight; or, more accurately, it will be to that, as 875 to 864, a difference not to be noticed, either in money or medicine, below the denomination of an ounce.

But it will be necessary to refer these weights to a determinate mass of some substance, the specific gravity of which is invariable. Rain-water is such a substance, and may be referred to everywhere, and through all time. It has been found by accurate experiments, that a cubic foot of rain-water weighs 1000 ounces Avoirdupois, standard weights of the Exchequer. It is true that among these standard weights, the committee reports small variations; but this experiment must decide in favor of those particular weights, between which and an integral mass of water, so remarkable a coincidence has been found. To render this standard more exact, the water should be weighed always in the same temperature of air, as heat, by increasing

its volume, lessens its specific gravity. The cellar of uniform temperature, is best for this also.

Let it, then, be established that an ounce is of the weight of a cube of rain-water, of one tenth of a foot, or rather, that it is the thousandth part of the weight of a cubic foot of rain-water, weighed in the standard temperature: that the series of weights of the United States shall consist of pounds, ounces, penny-weights, and grains: whereof

24 Grains shall be one pennyweight:

18 Penny-weights one ounce:

16 Ounces one pound.

COINS.

Congress in 1786 established the money unit at 375.64 troy grains of pure silver. It is proposed to enlarge this by about the third of a grain, in weight, or a mill, in value; that is to say, to establish it at 376 (or more exactly 376.02985) instead of 375.64 grains, because it will be shown that this, as the unit of coin, will link in system with the units of length, surface, capacity and weight, whenever it shall be thought proper to extend the decimal ratio through all these branches. It is to preserve the possibility of doing this, that this very minute alteration is proposed.

We have this proportion then, 875 to 864 as 376.02985 grains troy to 371.30261, the expression of the unit in the new grains.

Let it be declared, therefore, that the money unit, or dollar of the United States, shall contain 371.3 American grains of pure silver.

If nothing more then, is proposed to render uniform and staple the system we already possess, this may be effected on the plan herein detailed; the sum of which is, 1. That the present measures of length be retained and fixed by an invariable standard: 2 That the measures of surface remain as they are, and be invariable, also as the measures of length to which they are to refer: 3, That the unit of capacity, now so equivocal, be settled at a medium and convenient term, and defined by the same invariable

measures of length: 4. That the more known terms in the two kinds of weights be retained, and reduced to one series, and that they be referred to a definite mass of some substance, the specific gravity of which never changes: And 5. That the quantity of pure silver in the money unit be expressed in parts of the weights so defined.

In the whole of this no change is proposed, except an insensible one in the troy grain and pennyweight, and the very minute one in the money unit.

II.

But if it be thought that, either now, or at any future time, the citizens of the United States may be induced to undertake a thorough reformation of their whole system of Measures, Weights, and Coins, reducing every branch to the same decimal ratio already established in their Coins and thus bringing the calculation of the principal affairs of life within the arithmetic of every man who can multiply and divide plain numbers, greater changes will be necessary.

The unit of Measure is still that which must give law through the system: And from whatever unit we set out, the coincidences between the old and new ratios will be rare. All that can be done will be to chuse such an unit as will produce the most of these. In this respect the second rod has been found, on trial, to be far preferable to the second pendulum.

MEASURES OF LENGTH.

Let the second rod, then, as before described, be the standard of Measure; and let it be divided into five equal parts, each of which shall be called a Foot: For, perhaps, it may be better generally to retain the name of the nearest present Measure, where there is one tolerably near. It will be about one-quarter of an inch shorter than the present foot.

Let the Foot be divided into 10 inches.

The Inch into 10 lines;

The Line into 10 points;

Let 10 feet make a decad;

10 Decads a rood;

10 Roods a furlong;

10 Furlongs a mile.

SUPERFICIAL MEASURES.

Superficial measures have been estimated, and so may continue to be, in squares of the measures of length, except in the case of lands which have been estimated by squares, called roods and acres. Let the rood be equal to a square, every side of which is 100 feet. This will be 6483 English feet less than the English (7) rood every way, and 1311 square feet less in its whole contents, that is to say, about one eighth, in which proportion also 4 rood will be less than the present acre.

MEASURES OF CAPACITY.

Let the unit of capacity be the cubic foot, to be called a bushel. It will contain 1620.23 cubic inches, English; be about $\frac{1}{4}$ less than that before proposed to be adopted as a medium; 1-10 less than the bushel made from 8 of the Guildhall gallons; and 1-14 less than the bushel made from 8 Irish gallons of 217.6 cubic inches.

Let the bushel be divided into 10 pottles;

Each Pottle into 10 demi-pints;

Each Demi-pint into 10 metres, which will be of a cubic inch each;

Let 10 Bushels be a quarter, and

10 Quarters a last, or double-ton.

The measures for use being foursided, and the sides and bottoms rectangular, the bushel will be a foot cube;

The Pottle 5 inches square and 4 Inches deep;
 The Demi-pints 2 inches square, and $2\frac{1}{2}$ inches deep.
 The Metre, an inch cube.

WEIGHTS.

Let the weight of a cubic inch of rain-water, or the thousandth part of a cubic foot, be called an ounce; and let the ounce be divided into 10 double scruples;

The Double scruple into 10 carat;

The Carat into 10 minims, or demi-grains;

The Minim into 10 mites:

Let 10 Ounces make a pound:

10 Pounds a stone;

10 Stone a kental;

10 Kental a hogshead.

COINS.

Let the money-unit, or dollar contain eleven twelfths of an ounce of pure silver. This will be 376 troy grains (or more exactly 376.02985 troy grains) which will be about a third of a grain (or more exactly, .38985 of a grain) more than the present unit. This with the twelfth of alloy, already established, will make the dollar or unit, of the weight of an ounce, or of a cubic inch of rain-water, exactly. The series of mills, cents, dimes, dollars, and eagles to remain as already established (8).

The second rod, or the second pendulum, expressed in the measures of other countries, will give the proportion between their measures and those of the United States.

Measures, weights and coins thus referred to standards unchange-

able in their nature (as is the length of a rod vibrating seconds, and the weight of a definite mass of rain-water) will themselves be unchangeable. The standards too are such as to be accessible to all persons, in all times and places. The measures and weights derived from them, fall in so nearly with some of those now in use, as to facilitate their introduction; and, being arranged in decimal ratio, they are within the calculation of every one who possesses the first elements of arithmetic, and of easy comparison, both for foreigners and citizens, with the measures, weights and coins of other countries.

A gradual introduction would lessen the inconveniences which attend too sudden a substitution, even of an easier, for a more difficult system. After a given term, for instance, it might begin in the custom-houses, where the merchants would become familiarized to it. After a further term, it might be introduced into all legal proceedings; and merchants and traders in foreign commodities might be required to use it in their dealings with one another. After a still further term all other descriptions of people might receive it into common use. Too long a postponement, on the other hand, would increase the difficulties of its reception with the increase of our population.

THOMAS JEFFERSON,

Secretary of State.

APPENDIX

Containing Illustrations and Developements of some passages of the preceeding Report.

(1.) In the second pendulum with a spherical bob, call the distance between the centers of suspension, and of the bob, 2×19.575 , or $2d$. and the radius of the bob $= r$. then $2d : r :: r : \frac{rr}{2d}$ and 2-5 of this last proportion expresses the displacement of the center of oscillation, to wit, $\frac{2rr}{5 \times 2d} = \frac{rr}{5d}$. Two inches have been proposed as a proper diameter for such a bob. In that case r . will be $= 1$. inch, and $\frac{rr}{5d} = \frac{1}{97.87}$ inches.

In the cylindrical second rod, call the length of the rod 3×19.575 or $3d$. and its radius $= r$. and $\frac{rr}{2 \times 3d} = \frac{rr}{6d}$ will express the displacement of

the center of oscillation. It is thought the rod will be sufficiently inflexible if it be 1-5 of an inch in diameter. Then r . will be $\frac{1}{11}$ inch, and $\frac{rr}{6d} = \frac{1}{11745}$ inches, which is but the 120th part of the displacement in the case of the pendulum, with a spherical bob; and but the 689,710th part of the whole length of the rod. If the rod be even of half an inch diameter, the displacement will be but 1-1879 of an inch, or 1-110356 of the length of the rod.

(2.) Sir Isaac Newton computes the pendulum for 45° to be 36 pouces 8 428 lignes. Picard made the English foot 11 pouces 2.6 lignes, and Dr. Maskelyne 11 pouces 3.11 lignes. D'Alembert states it at 11 pouces 3 lignes, which has been used in these calculations as a middle term, and gives us $\frac{\text{Pouces Lignes}}{36 \quad 8.428} = 39.1491$ inches. This length for the pendulum of 45° had been adopted in this report before the Bishop of Autun's proposition was known here. He relies on Mairan's ratio for the length of the pendulum in the latitude of Paris, to wit, $504:257::72$ pouces to a 4th proportional, which will be $\frac{\text{Pouces}}{36 \quad 7.1428} = 39.1619$ inches, the length of the pendulum for latitude $48^\circ 50'$. The difference between this and the pendulum for 45° is .0113 of an inch. So that the pendulum for 45° would be estimated, according to Mairan at $39.1619 - .0113 = 39.1506$ inches, almost precisely the same with Newton's computation herein adopted.

(3.) Sir Isaac Newton's computations for the different degrees of latitude from 30° to 45° , are as follows:

	<i>Pieds.</i>	<i>Lignes.</i>		<i>Pieds.</i>	<i>Lignes.</i>
30°	3	7.948	42°	3	8.327
35°	3	8.099	43°	3	8.361
40°	3	8.261	44°	3	8.394
41°	3	8.294	45°	3	8.428

(4.) or more exactly $144:175::224:272.2$

(5.) or more exactly $62.5:1728::77.7:2150.39$

(6.) the merchant's weight.

(7.) The English rod contains 10890 square feet ≈ 104.355 feet square.

(8.) The Measures, Weights and Coins of the decimal system, estimated in those of England, now used in the United States.

I. MEASURES OF LENGTH.

	Feet.	Equivalent in English Measure.
The Point	.001	.011 inches.
Line	.01	.117
Inch	.1	1.174 about 1-7 more than the English inch.
Foot	1.	11.744736 } about 1-48 less than the English foot.
Dead Rod	10.	.9787 about 1-48 less than the 10 feet rod of the carpenters.
Furlong	100.	97.872 about 1-16 less than the side of an English square rood.
Mile	1000.	978.728 about $\frac{1}{2}$ more than the English furlong.
	10000.	9787.28 about 1 6-7 English mile, nearly the Scotch and Irish mile, and $\frac{1}{2}$ the German mile.

2. SUPERFICIAL MEASURE.

Rood	9579.085 about $\frac{1}{8}$ less than the English rood.
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3. MEASURES OF CAPACITY.

	Bushels.	Cub. inches.
The Metre	.001	1.6202.
Denipint	.01	16.202 about 1-24 less than the English half pint.
Pottle	.1	162.022 about $\frac{1}{2}$ more than the English pottle.
Bushel	1.	1620.229596620920160256 } about $\frac{1}{4}$ less than the middle sized English bushel.
Quarter	10.	93763286841.884352 cub. feet
Last	100.	9.376 about 1-5 less than the English quarter.
		93.763 about 1-7 more than the English last.

4. WEIGHTS.

	Pounds.	Avoirdupois,	Troy.
The <i>Mite</i>	.00001	-	.041 grains about 1-5 less than the English mite
<i>Minor</i>	.0001	-	.4102 about 1-5 less than the half grain Troy.
<i>Demigrain</i>	.001	-	4.102 about 1-40 more than the carat Troy.
<i>Carat</i>	.01	-	41.021 about 1-40 more than 2 scruples Troy.
<i>Double</i>	.1	937632868414884352 oz.	($\frac{410}{85461}$ oz.) about 1-16 less than the ounce Avoir.
<i>Scruple</i>	1.	{ 9.376	712175 lb. about $\frac{1}{4}$ less than the pound Troy.
<i>Ounce</i>	10.	{ 586020540093 lb.	7.121 about $\frac{1}{4}$ less than the English stone of 8 lb. Avoirdupois
<i>Pound</i>	100.	{ 937.632 oz.	71.217 about 4-10 less than the English Kental of 100 lbs. Avoirdupois.
<i>Stone</i>	1000.	{ 58.602 lb.	712.175
<i>Kental</i>		{ 9376 328 oz.	
<i>Hogshead</i>		{ 586.0205 lb.	

5. COINS.

	Dollars.		Troy Grains.
The <i>Mill</i>	.001	The <i>Dollar</i>	376.02985 Pure silver.
<i>Cent</i>	.01		34 18453 alloy.
<i>Dime</i>	.1	<i>Eagle</i>	410.21438

INTERNATIONAL INSTITUTE

FOR

PRESERVING AND PERFECTING

Weights and Measures.

ACTUAL MEASURES OF THE GREAT PYRAMID OF EGYPT, IN TERMS
OF THE BRITISH INCH: DISCLOSING, BY ITS MEANS, THE
ARCHITECTURAL SYSTEM EMPLOYED IN THE CON-
STRUCTION, TO ACCOMPANY THE SEC-
TIONAL PLAN PREPARED BY
MR. CHARLES LATIMER.

CLEVELAND, OHIO:
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PREFACE.

The following specifications of the *architectural* measures of the Great Pyramid of Egypt, have been especially prepared for the Auxiliary Society of this Institute. The object is, that the detail of measures may accompany the sectional plan of the pyramid, prepared for the Society by Mr. Charles Latimer.

The plan and its measures afford, in the opinion of the author, because of the rigid exactness of the work, convincing evidence that the British inch, viz., the standard taken by Capt. Kater (of the Royal Commission in England), for Scotland, was the *standard unit* of measure by which, some thousands of years ago, the pyramid was constructed, in whole and in part.

Beyond this, it will be seen, that the British inch is, (1), founded on the *numerical expression* of the geometrical relation of circumference to diameter of a circle; (2), that it is the *base* on which were constructed the ancient cubit values; (3), that the cubit values in the pyramid run correlatively and and co-ordinately, with the British measures, in terms of inches, feet, yards, and miles; and (4), that the cubit values when reduced to British feet and inches, in the measures of the pyramid, exhibit measures of *time* and *astronomy*.

If these things are so, then the whole world possesses no unit of measure so precious as this British inch. It has a

history of some five thousand years, at least. It has preserved its own integrity during that period. It is founded on an eternal geometrical truth, and applies as well to interpret the handiwork of God in the heavens, as the works of man on the earth.

J. RALSTON SKINNER.

Toledo, (*Easter*), 1880.

INTERNATIONAL INSTITUTE

FOR

PRESERVING AND PERFECTING

WEIGHTS AND MEASURES.

OIHO AUXILIARY SOCIETY, CLEVELAND.

ACTUAL MEASURES OF THE GREAT PYRAMID OF EGYPT, DIS-
CLOSING THE ARCHITECTURAL SYSTEM EMPLOYED.

It was discovered by Rev. John Taylor, that the *height* of the pyramid of Jizeh, or Cheops, bore the relation to *twice the base side*, of *diameter to circumference of a circle*. This relation is *typical* of its interior construction.

Take the numerical form 20612 : 6561. This is agreeably to the late John A. Parker, of the City of New York, the true integral relation of circumference to diameter of a circle. What is called the *pi* value of this expression is 3.14159426+. The Legendre, or established value, is 3.14159265+. The

difference in all but extraordinary exceptions, is quite inappreciable—the value used in ordinary engineering is 3.1416.

§ 1. (a) Take this form, $20612 : 6561$, as $20^{.612} : 6^{.561}$, and consider it as *British inches*; then this $20^{.612}$ B. inches is the ancient Egyptian *Cubit* value, one of the so-called royal cubits. From measurements of this pyramid by Prof. Greaves, of Oxford, England, Sir Isaac Newton restored the value of this ancient cubit, which, to specialize it, is now called the *Turin cubit*, as 20.604 B. inches, or 1.717 B. feet. From measures of the catacombs of Osimandya, Egypt, by the French *savans*, under Napoleon, this cubit was restored in terms of the French meter, as .523524, which gives, by reduction to B. inches, $20^{.61156}$. This last value, plus .00044 of the inch, equals $20^{.612}$, or the above given value of circumference. We take it, then, that the true restoration of this cubit is $20^{.612}$ British inches; and that it had its origin from the geometrical source of $20612 : 6561$, or of circumference of a circle whose diameter is 6561.

(b) Take the form, or proportion—

$20^{.612} : 6^{.561} :: 64^{.8} : 20^{.6264700174+}$ as in British inches. It is seen that the fourth term is exceedingly near in value to the *first* term; yet is, indeed, of a very significant difference. (1) While the first term is a *circumference* or curved value, the fourth term is a *diameter*, or straight line, value. (2) This fourth term is diameter to an integral circumference value, viz., $64^{.8}$.

Now, this fourth term, as B. inches, is the so-called *Nilometer cubit* value, or the other of the royal cubits. The restoration of this cubit value, by Mr. Wilkinson, was found to be $20^{.625}$ B. inches, showing a difference from the above of .0015 of an inch.

Thus we see that these two royal cubits were geometrically related to each other, and referred themselves to the above numerical relation of circumference to diameter of a circle.

(c) Take $6^{.561}$ out of the above formula, as B. inches—multiply it by $\frac{1}{\pi}$, and the result will be $11^{.664}$ B. inches. This result gives the restored value of the ancient Roman *foot*. An abundance of authorities could be given for this.

§ 2. The *analytical unit* of measure, so-called, in geometry, is obtained by the formula $\frac{180}{\pi}$.

This analytical unit is where the length of a curved line of a circle is the same, numerically with the lengths of the two radii embracing that curve. By the above form of Mr. Parker, in the circle of 360° —(1), the radii, containing the curve; (2), the curve itself; and (3), the angle measuring the curve; all are numerically of the same value, thus—

Value of radius, say in feet.....	57.295750048+
Value of curve.....	57.295750048+
Value of angle, in degrees.....	57°.295750048+

Here it is seen that *feet*, or any other unit of measure, can be read as *degrees*. The two readings are convertible. Now, this *analytical unit* is directly obtainable from the above proportion; for divide $64800 : 20626.4700174+$ by 360, and there results $180 : 57.2957500.48+$, or circumference to diameter. If $57.295+$ is taken as *radius*, then 180 must be multiplied by 2, making 360 for its circumference.

(a) This is given, because, while the type of the structure of the pyramid is circumference to diameter, the subordinate

from which the type is taken is this veritable analytical unit of measure.

THE DESCENDING PASSAGE-WAY.

§ 3. (a) The measure of the floor line of this passage is given by Col. Howard Vyse, as "about 4126. inches."

The length of this line seems to be a key to the interior construction in many measures and, in fact, of the proportions of the entire mass.

Multiply 100 Nilometer cubits by 2, or

$$2062.64700174 \times 2 = 4125.29400348 + \text{inches.}$$

$$\text{or, } 343.774500291 + \text{feet.}$$

or, 200 Nilometer cubits. This is the length of the floor-line of this passage-way.

(b) 343.7745+feet, is diameter to a circumference of 1080 feet. Now, 1080 is the number limiting the Hebrew measures of *time*—1080 scruples is equal to one *minute*. They had a calendar form made of three values, viz., the luni-solar year of 355 days, the calendar year of 360 days, and the vague solar year of 365 days; and 355 + 360 + 365 equals 1080.

(c) 206264.7001+ is radius of a circle used at the present day in the formula for finding the sun's parallax and distance (See Godfray's Astronomy).

(d) 3437.74500271 + as *minutes*, is the number of minutes in the radius of the *analytical unit* of measure; or of the circle of 360°. Therefore, 206264.7001+ is that radius in *seconds*. For, $57^{\circ}.295750048 + \times 60$ equals 3437'.74500271 + *minutes*, etc. Thus it is seen that these measures are *astronomical*; and co-ordinate measures of *space* and *time*.

(e) Herschel says a ray of light from α Draconis (the Pole Star, at the time of building the pyramid), at its lower culmi-

nation, looked down the passage-way. As the earth in passing around its orbit did not displace this star, this ray might be taken for the immovable axle around which the heavens actually turned; and the lower end of the passage might be taken as the center of the earth. Then the length of the passage-way, as *feet*, might numerically be taken as the *radius*, in *minutes*, of the terrestrial circle of 360°, and likewise as the radius as a celestial circle of 360° sweeping so as to cut and include the North Star. This shows that our astronomical modes have descended from a date at least as remote as the building of this pyramid.

THE LOCATION OF THIS PASSAGE-WAY.

§ 4. This passage must be located *exactly* right, relatively (1), to the exterior slope of the mass; (2), to the ground-level of the foundation; and (3) to the vertical axial line of the pyramid—otherwise, the locations and measures of the interior works *must* fail. So also with regard to the *height* of the passage, perpendicular to its incline.

(a) The passage enters on the *north* slope of the pyramid, at a considerable distance above the *pavement*. The *pavement* is one Turin cubit thick, and is included in the mass of the pyramid. Vyse gives this thickness, measured here and there, as 21 inches. One Turin cubit is 20⁶/₁₂ B. inches. It was a matter of great difficulty to solve the problem of the *vertical* elevation of the intersection of the floor line of the passage-way with the slope line of the mass. Col. Vyse's angle of the passage was 26° 41', considerably too great. His elements of measure, calculated by one of Piazzi Smith's angles, viz., 26° 28' 7", which is exceedingly accurate, gives this vertical height above the ground level as 53.1975+ feet.

Now, the vertical height of this intersection above the ground level is precisely 20.612 inches \times 31, or 31 Turin cubits. This includes the pavement thickness of 20.⁶¹² inches, one T. cubit. Above the pavement, then, this line is just 30 T. cubits, and this is precisely 51.53 feet.

A base line run horizontally from the foot of this 30 cubit line, so as to intersect the slope of the pyramid, will be 40.4715881+ feet; and this will bear the proportion to 51.53 as $\frac{1}{4}$ of a circumference to a full diameter—and we will have the proportion

$$40.47+ : 5.53 : : 51.53 : 65.61.$$

Now, Mr. Parker says that a square of 81 to the side gives an *area* of 6561; and that the *area* of the circle inscribed in this square, will be 5153. But changing from *area* to *linear* measure, then, he says, a circle having 6561 for its diameter, will have a circumference of 5153×4 equals 20612.

Thus, one standing on this pavement, and ascending to the mouth of this passage-way, has, in fact, under his very nose, the *geometrical modulus* from whence the proportions and measures of the pyramid.

(b) A *vertical* line, raised from the very foot of the floor-line of this descending passage-way, and extended to touch the horizontal ground level or base line of the pyramid, will be exactly 100 British feet, or 1200 inches.

The half base side of the pyramid, in feet, is diameter to a circumference of just 1200 feet. Here, in this 1200 inches, we have in a scale of inches for feet, the same number, and may serve as a check.

(c) Having thus located this floor line of the descending passage-way, we can take its angle of elevation, to compare it

with the observations of Prof. Smyth, taken with so much care. This angle is found to be $26^{\circ} 28' 24'' 10$. Of the various angles taken by Prof. Smyth, all taken with the same care, and having the same probability of being correct, as he says, we will take the mean of 10, taken with the circular clinometer. The mean is $26' 28' 16''$, showing on comparison, a difference of only 8"; an amount exceedingly difficult to read on an instrument.

(d) It now remains to obtain the *height* of this passage-way *perpendicular to its incline*. This must be obtained with absolute accuracy; otherwise, no right measures can be had as to the upper interior works resting on this passage-way. Piazzzi Smyth's most approved measure of this height is 47.24 inches. The architectural measure is 47.2519656+ inches. Draw in a roof line of this passage-way, at this height; make this line parallel to, and of equal length with, the floor line, intersecting the slope line of the pyramid and thence down to the foot of the passage. From the extreme lower end of this roof line drop a perpendicular, say *a b*, upon the floor line of the horizontal passage-way. The length of this line, *a b*, is the key to the height of the passage; and necessarily also fastens the location of the passage-way as to elevation or angle.

The length of this line, *a b*, is 3.16227666+ feet, or 37.94733192+ inches. The interpretation of this line is very remarkable. Form of circumference to diameter is 20612 : 6561, as said. Circumference to a diameter of 1 foot is 3.14159426+ feet. Diameter to a circumference of 10 feet is 3.1830972249+ feet. The *mean proportional* between these values is (as stated) the value of *a b*, or 3.16227766+ feet.

Now, this last value is the *square root* of 10. In inches, or 37.94733192+ inches, it is the square root of 1440 inches. This half base side of the pyramid is diameter to a circumference of 14400 inches—thus the relation becomes manifest. This half base side equals $\frac{200}{18}$ of the length of the King's Chamber. This half base side is connected in relation to the descending passage-way and to the King's Chamber, etc. Hence this 1440, which is 12^2 multiplied by 10, seems connected all through the structure. So also, 1440 as *minutes*, equals one day of 24 hours. Hence co-ordination with measures of *time*.

(e) The length of the horizontal line (or the floor line of the passage-way to the *subterranean chamber*), from the foot of the floor line of the descending passage-way to the vertical axial line of the pyramid itself, is 32.4237769849+ feet, or 389.0853+ inches. Howard Vyse gives the perpendicular height of this horizontal passage, as 36 inches, or 3 feet or 1 yard. He gives the length of the roof line of the horizontal passage to the subterranean chamber, as 324 inches, or 27 feet, or 9 yards.

THE BASE SIDE AND HEIGHT OF THE PYRAMID.

§ 5. The length of the descending passage-way is 200 Nilometer cubits. Add $\frac{1}{3}$ of this to itself, and then in $222\frac{2}{3}$ cubits we have the length of the half base side of the pyramid. 2062.64700174+ inches $\times 2$ gives the length of this passage-way. To 2062.64700174+ add its $\frac{1}{3}$ th, or 229.18300019+, and there results 2291.8300019+. Multiply by 2, and we have 4583.660003880+ inches, or 381.971666990+ feet. This is the half base side of the structure; and the entire base side is 763.94333398+ feet, or 9167.320007760+ inches.

The French measured this as 9163.44 inches.
Col. Vyse measured it as 9168. “

(a) This line, in the first place, is seen to be directly related to the length of the descending passage-way.

(b) In this measure of B. feet, this 763+ feet is diameter to a circumference of precisely 2400 feet; as inches of 28800 inches.

(c) The $\frac{1}{3}$ of $\frac{1}{2}$ the descending passage-way, in inches, or 229.183+ inches, was thus taken as an exhibit, because this length of 229.183+ inches is the height of the King's Chamber.

The height of the pyramid itself, were it not truncated, is diameter to a circumference of twice this base side; consequently, it must be 486.341+ feet. This condition demands that the angle formed by the slope line with the ground level must be $51^\circ 51' 14'' 5$. However, Vyse measured the angle of a casing-stone, *in situ*, and found it $51^\circ 50'$ to $51^\circ 52'$, which almost conclusively shows the true measure.

From what has been said, viz., that the base length is diameter to a circumference of 2400 feet, it becomes obvious that an equivalent structure can be made on a base of 2400 feet. Take 24 inches, or 24 feet, as a base side. Construct on this a relatively proportional pyramid, in all its details. Then, taking the Parker *modulus*, if these measures are converted from circumference to diameter values, the exact real measures of the pyramid will result numerically.

Note—If the pyramid be constructed from the form 20612 : 6561, instead of the Nilometer measure, then its $\frac{1}{2}$ base side would be 381.7037037+ feet, to a height of 243 feet. Now, the real pyramid *is* truncated, and the little pyramid so cut

off approximates (at the line of finish, or the platform) very closely to 31.808+ feet for base, and 20.25 feet for height. As inches, these values are respectively 381.7037+, and 243.

LENGTH OF THAT PART OF THE VERTICAL AXIAL LINE OF THE PYRAMID BETWEEN THE GROUND LEVEL, OR FOUNDATION, AND THE INTERSECTION OF THE FLOOR LINE OF THE GRAND GALLERY.

§ 6. This is one of the salient governing lines, because it is the vertical axial line of the entire pyramid. That the Grand Gallery floor line terminates with this intersection, shows that the architect worked up to this vertical axial line as a governing one. It would show this more conclusively did the height of this vertical line to this intersection, show (1) some comprehensive measure, and (2) co-ordination with other measures, in identical kind, and in likeness of use.

(a) This line is 8° Nilometer cubits. Multiply 20.6264700-174+ by 80 and we have 1650.11760139+ inches, or 80 N. cubits. The peculiarity of the line is that it, in inches, is diameter to a circumference of exactly 5184 inches. Taken as square inches, this is the number of square inches in 4 square yards. But taken as a time measure, this is the characteristic value of a solar day in *thirds*, because 5184000''' equals one solar day. So 5184 is 72×72 , or the square of 72; and 72 is circumference to a diameter of 22.9183+ or the $\frac{10}{9}$ ths part of a Nilometer cubit. 80 cubits $\times 72$, equals the length of the descending passage-way. 80 cubits divided by 4 equals 20 cubits, or the length of the King's Chamber, etc. The fact is, that this measure is wonderfully comprehensive, and, as if to accord with this fact, perhaps the most remarkable feature

about it is to be related—it is the terminal or closing of the Hebrew scale of long measures, in the technical term of *The Measuring Line*: that is, "80 cubits make 1 measuring line" (Bagster's Polyglot Bible).

In actual pyramid work the value of this line is confirmed by such a number of architectural conditions, harmonies, and so on, that it would take up too much space to enumerate them.

FLOOR LINE OF GRAND GALLERY.

§ 7. Let us work back from this intersection—and *first* in order comes the floor line of the Grand Gallery. Piazzzi Smyth gives this line—"Full length, east side, 1882.6 inches; full length, west side, 1883 inches." The length of this line is $91.1\frac{33}{100}$ Turin cubits.

20.612 (Turin cubit, in inches) $\times 91.1\frac{33}{100} = 1882.49396$ inches. This differs from Mr. Smyth's measure by $\frac{1}{10}$ of an inch in this great length of actual measure by him.

With respect to the vertical axial line, the floor line of the Grand Gallery had to be placed agreeably to Prof. Smyth's angles. He took means of sets of trials. One $26^{\circ} 17' 4''$, one $26^{\circ} 17' 3''$, and one $26^{\circ} 17' 53''$.

The author found a mode, by these cubic values, of finding the horizontal distance from the foot of the Grand Gallery to the Queen's Chamber. By this mode (Crown Jewels, page 55), this distance was found to be 1519.3507+ inches. Piazzzi Smyth's measure of this line was 1519.4, showing a difference of .04 of an inch. Then, moreover, it appeared that the typical width of the Queen's Chamber was taken at 206.12 inches, or 10 Turin cubits (typical width of King's Chamber 10 Nilometer cubits). Then, a very curious fact disclosed

itself, viz., that by these measures, *the relation of the Queen's Chamber to the vertical axial line*, worked as a mode of placing all the lines, and of confirming their measures. The author found that a portion of the *width* of the Queen's Chamber, was *cut off to the west of the vertical axial line*, and that the portion thus cut off measured $3.14159426 + \text{feet}$, or circumference in feet (under the Parker mode) to just *one linear foot*, British measure, for its diameter—that is, just 12 B. inches. This result was literally amazing. And this being done, changed the angle of location of the floor line of the Grand Gallery *but a very few seconds*. The author then found that this feature served, also, as a mode of determining the height and true width of the Queen's Chamber; confirming, thereby, its typical width of 10 T. cubits or 206.12 inches. The vertical height from this horizontal line to the intersection of the floor line of the Grand Gallery, with the vertical axial line, was found to be $69.48255243 + \text{feet}$.

It will be observed that the space of the length of the floor line of the first ascending passage is now left undetermined; and it will depend upon the measure of its closing, in comparison with Mr. Smyth's most exquisitely accurate results, whether all the work hereinbefore stated has been accurately and *architecturally* correct.

DISTANCE FROM ARCHITECTURAL FOOT OF ROOF LINE OF THE DESCENDING PASSAGE-WAY, UPWARD ON ITS INCLINE, TO THE INTERSECTION OF THE FLOOR LINE OF THE ASCENDING PASSAGE-WAY.

Architecturally, for the purpose of determining the height of the descending passage-way, perpendicular to its incline, this length is found to be $247.75265939 + \text{feet}$. (This is a

most wonderful measure for the co-ordination of lunar with solar cycles). This measure is determined by the parallelism of the roof with the floor line of the descending passage-way. Now, to carry out another set of measures ($2061.2 + 1030.6$ inches), this, in practical mason work, was reduced to 247.7 feet. Col. Howard Vyse's measure was 247.71 feet (Source of Measures, p. 133).

Take the $247.7526 +$, to exactly determine the intersection.

THE LENGTH OF THE FLOOR LINE OF THE FIRST ASCENDING PASSAGE, SO-CALLED.

Having arrived at the stated terminal data for closing all the lines, this distance, viz., of length of the floor line of this ascending passage-way, is geometrically found to be $1484.19608376 + \text{inches}$, or $123.68300698 + \text{feet}$. Piazzì Smyth's measure of this line is 1484.196 inches, by actual measure. His measures are as follows: Length of floor line down to portcullis blocks, 1291.2 inches; length of portcullis blocks, 178.8 inches; length thence to roof line of descending passage, 14.2 inches; total, 1484.2 inches. The author has never found any interpretation of this line. The angles of these inclines, viz., (1) of the ascending passage, and (2), of the Grand Gallery, agree to *a very few seconds* with those of Mr. Smyth. These inclines differ from each other, the angle of the Grand Gallery being the largest. The portcullis blocks are tapered, and wider at the upper end. Piazzì Smyth gives the breadth of their middle, for the average, as 38.15 inches. It is probably $\frac{2061.2}{54} = 38.17037 + \text{inches}$. The height perpendicular to incline may be taken as the same as that of the descending passage, viz., $47.254 + \text{inches}$. Mr. Smyth gives this at these blocks as 47.3 to 47.5 inches.

NOTE.—The vertical height of the upper end of the floor of the ascending passage, above its foot, is 54.4218+ feet. Vertical height from foot of floor line of Grand Gallery to its top, 69.4825+ feet, or 833.790+ inches, then a vertical raise of 7 inches to King's Chamber level; then, by Howard Vyse, a vertical height of 831 inches to the apex of gable of roof surmounting the chamber over the King's Chamber. The vertical raise to the upper horizontal face of the great step, instead of 7 inches, is 6.2 inches. Piazzzi Smyth says the polished walls of the King's Chamber extend down 5 inches below its floor surface. Vertical height of north end of great step, $30+6.2$ equals 36.2 inches; length of its surface, from north end to vertical axial line, 60.726+ inches; joint of the stone is beyond this vertical axial line, so as to make the whole length of the surface of the stone 62.2 inches. From edge of great step to last cut out in floor of antechamber, or south end thereof, on one side, 229.1 ($\frac{1}{3}$ of N. cubit 2.29183, height of King's Chamber, 229.183), and from edge of great step to King's Chamber, 330.3+, by Piazzzi Smyth. Width of King's Chamber, 206.2647+ inches, or 10 Nilometer cubits. Length of King's Chamber, 412.5294 inches, or 20 Nilometer cubits. Height of King's Chamber, $\frac{1}{9}$ ths of 20.62647+ inches, or 229.183+ inches. Piazzzi Smyth gives length of King's Chamber as 412.56 inches; breadth, 206.28 inches. He is uncertain as to the height, because of the disturbed state of the floor—become so since the time of Vyse. Vyse gives this height as 229.1. Aiton and Inglis gives this height as 229.1 to 229.2 inches. Mr. E. W. Lane gives width of King's Chamber as 206.25 inches, and length as 412.5 inches. Prof. Smyth says: N. end of great step to N. end of antechamber, east side, 113.1; west side, 113.5 inches, to S. end of ante-

chamber, 229.4 to 229.8 inches. Whole height from floor to ceiling, from 149.2 to 149.5 inches. For Grand Gallery measures, reference is made to Prof. Smyth's works. Vertical height of foot of floor line of ascending passage above the ground level, or base of pyramid, 13.605364+ feet. Horizontal distance from same foot of floor line to vertical axial line, is the square root of 63360, or 251.714123560+ feet. As inches, 63360 inches equals 1 B. mile, for 63360 divided by 12 equals 5280 feet, or 1 mile. Height of north passage to antechamber, 43.7 inches; south passage, thence to King's Chamber, 43.6 to 43.8 inches. Take the forms 20612 and 2062647+ : multiply 20612 by $\frac{4}{3}$, and there results a form by which Mr. Parker procures the exact *time of the moon about the earth*: multiply this last product again by $\frac{4}{3}$, and there results a form by which he obtains the *exact time of the solar year*. Now, however, raise 20626.47+ by the same mode, i.e., multiply it by $\frac{16}{9}$, add there results the exact number of inches in the total circumference of the four base sides of the pyramid.

While this work *must* appear most remarkable to any trained mind, yet, for a full appreciation of it, it is referred to experienced practical architects and engineers; those who, in addition to theoretical learning, have had great experience in the *practical application* of measures and scales of measures,

THE
FRENCH METRIC SYSTEM

— OR —

The Battle of the Standards.

A DISCUSSION OF THE COMPARATIVE MERITS OF THE METRIC
SYSTEM AND THE STANDARDS OF THE GREAT PYRAMID.

BY

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PREFACE.

It has been impossible for me, engaged as I am, to devote the time and research necessary to take a thoroughly comprehensive view of the metric question of the day. I have thrown together a few thoughts, with the investigations and opinions of many minds, in the hope of awakening the advocates of the French system to the defeat that lies before them, and perchance of turning them from a headlong course in one direction to the consideration of another method, which I trust they may find a more excellent way, viz: that of improving upon what has been given us. And I especially desire to awake in the minds of those who are thinking, and present to those who have not yet thought, upon this subject, an interest in the measures of the Great Pyramid, which I am free to say I believe offer to us the true solution of the questions agitating the world upon weights and measures.

Doubtless there are those who will pronounce some of my expressions harsh, but a little investigation into the methods of the wire pullers to force the system upon the people may cause them to change their minds.

Of course, I expect the usual amount of shrugging of shoulders and vituperation of those who wait for Mrs. Grundy, and of those who will not see, but whilst I would not wantonly offend any man, I have no fear of defending what I believe to be the truth. I commend to all the investigation of the symbol on page 52 of this pamphlet—the reverse of the seal of the United States.

THE FRENCH METRIC SYSTEM,

— OR —

The Battle of the Standards.

In the history of the past, and especially in sacred history, we have evidence of a religion, a refinement and education which proves that our race is not the result of a development, but that man came from his Maker a living soul.

The race which could furnish an Enoch, a Seth, an Abraham, a Melchizedek, a Job, must have left in the everlasting rocks an evidence of its knowledge, power and wisdom; and left traditions indelibly impressed upon the minds of its seed up to the present moment of all that was holy, of all that was glorious, of all that was useful, of all that was revealed in the past, of what was, and is, and is to be.

Among these, could it be possible that the all-important matter of just weights and measures was overlooked?

In a later age, when the wisdom of a former glorious period was briefly recorded by Him who was the law-giver

and oracle for those who were to be the guardians of the Holy Scriptures, that they might be handed down to instruct us, surely nothing is more earnestly enjoined than the importance of just weights and measures.

Of all things recorded, of all traditions of the past, nothing in the shape of a measuring rod comes down to us more certainly and clearly distinguished as God-given, than the cubit. Of these there were two—the common, or Egyptian, or proper; and the sacred—Ezekiel xlii. 13; the former about 21·7 inches, the latter, “a cubit and a span,” 25 inches. This measure stands to-day an enduring monument of the revelation and wisdom of the past, in the cubit, which is the hereditary measure of almost all nations, called the *ell*, *braccio* or *arm*, in many countries. There is probably no one word the same in all languages of the globe derived from the universal language of the earliest ages of the globe, more common to all than the measure of the arm or cubit, which is either exactly or to within a small fraction of 25 English inches. The Persian “*Guerze*” is exactly 25 inches; so of the inch, called in French, before they abolished it, “*pouce*,” or *thumb*, and in Spanish, “*pulgada*,” and some other nations call it the “thumb;” is an almost universal measure, and as convenient as universal, for it is just about the breadth of the thumb.

These measures speak to us of the wisdom of the past as plainly as possible, and the simple little inch we will see, too, is not only according to nature, but is earth commensurable.

We cannot but admit that when we observe the universality of these measures, that they were all derived from one common origin; besides, the inch is referable to the thumb, the foot to the length of the foot, the cubit to

the arm, the fathom to the height of a man, and the yard to half the height of a man. The followers of Darwin, and the infidel will both deny the inspiration of our weights and measures, and ascribe all of our progress to a natural progression; and, doubtless, will hail the appearance of the new French unit as another argument in favor of their peculiar views and theories, and will be equally ready to re-adopt the fantastic freaks of the French Revolution, even to abandoning the Sabbath and burning the Bible.

In addition to the inch we find that the quarter, containing 17·745+ cubic inches, was known in many countries; likewise the sack, containing 7·146 cubic inches, the bushel, containing 2858 cubic inches. The pound avoirdupois, containing about 7212 grains, is found in various parts of the world. Yet all of these, with all of their ramifications and references, the French metre advocates propose to overthrow at one fell swoop, leaving not a vestige to tell the tale of the past; and even go farther, to imprison and fine any who shall dare to use or even possess any of the hereditary measures of the world, as it is to-day in despotic states.

Washington brought the subject of weights and measures to the first Congress, and from that time to the present various efforts have been made to grasp it, but each attempt has proved that a radical change was too stupendous to be accomplished by any one nation.

Two plans were proposed by the fathers of the republic: the one, to define and render uniform and stable the existing system, in which the ounce was to weigh the one-thousandth of a cubic foot of water; the other, by Thomas Jefferson, a decimal system similar to the French in

some respects, with a difference in length of the unit. It is somewhat remarkable that the latter was adopted by the committee and reported April 4th, 1792, but without result.

The French nation has shown itself especially solicitous in getting other nations to adopt their standard, and on December 20th, 1875, a metrical convention was held at its call, twenty-two nations being represented; England, however, having no accredited agent, but the United States being represented by Mr. Washburne. Notwithstanding the fact that an agreement was signed to establish an International Metrical Bureau at Paris, our government stands as yet uncommitted, because the action was not ratified by Congress; and it is refreshing to read the reproachful letter of the President of that International Committee, Ibanez, to Mr. Noyes, our Ambassador at Paris, in which he says: "It would be greatly to be regretted if the *Anglo-Saxon world* determined to maintain, definitely, a separate position in regard to weights and measures, etc."

This word, "Anglo-Saxon world" is most significant, and I trust its meaning will be more thoroughly understood when the advocates of the French system are completely overthrown, as they will be.

It may be thought by some unreasoning persons that there has been so much said and done with reference to the French Metric system, that there now remains nothing more to be said or done but for Congress to issue its edict, and that thereupon the French Metric system will be at once an accomplished fact and the law of the land; and to this end, certain inconsiderate persons, in addition to schemers for gain, are devoting a large amount of ink and paper, to say nothing of brains, in getting members of

Congress, emulous of fame and ambitious of handing their names down to posterity, to act as the champions of the pet schemes of these "closet philosophers." To these gentlemen it may be well to say of their country, if it could not be said in those days of the despotic governments in Europe: "There is a power behind the throne greater than the throne itself;" and when this power is once aroused, our fifty millions—the farmer, whose name is legion, the mechanic, the machinist, the manufacturer, the surveyor, the surgeon, the doctor, the grocer, the merchant, aye, and even the great, overwhelming majority of civil engineers, of whose society I am a member, will rise up and demand of you who are beginning wrong end foremost in this matter: "Where was the French metre when the great pyramids were built? 'Who is this that darkeneth counsel with words without knowledge?' How dare you attempt to foist upon us without our consent new weights and measures unknown to us and to our fathers? Understand that we will, with one blast of our mouth, cast down your false measure, founded upon a false principle, and even

MEASURED IN A FALSE MANNER,

so that the very measure you propose to give us is not the measure of what you tried to measure."

It may be well, therefore, for these closet philosophers and their followers to call a halt, and go upon the persuasive rather than the forcing plan; for, depend upon it, that the people will not submit to it.

The various scientific and practical societies have been urged by a certain few, determined to carry their designs into execution, to endorse the French Metric system. These schemers have set to work systematically and have

repeatedly induced the managers of these societies to obtain a vote endorsing the Metric system; and thus thousands have voted for a system of which they know nothing, and given the sanction of the societies to a subject to which no proper attention or investigation had been paid or given. With these doubtful endorsements they have set to work upon the Congress of the United States, to get that body to endorse their views and force upon the people prematurely, not only a new system, but a *prematurely born system*.

What is a metre? What is a French metre? It is simply 39.3707904+ English inches. What do you think of that, farmers and mechanics? And what does this 39 inches *plus* mean? Well, it means that the French tried to measure the quadrant, or the fourth part of the meridian of Paris, of which the above was supposed to be the 10,000,000th part; but which afterwards was found to be incorrect, the quadrant being, maybe, 10,001,850 metres for the meridian of Paris. Hence, the French, have an erroneous basis which we are asked to adopt. Was not the birth of the system then premature?

Every engineer is aware of the great importance of accuracy. Now, if we are to begin a new system, and intend adopting the Metric system, let us begin with having a correct standard; let us have a correct metre. Let us adopt, then, a correct measure; not the French one, which is incorrect and so acknowledged to be, for it is the measure of nothing in nature that we know anything about.

What is the origin of the French Metric system? In 1790 the French asked the English to join them in ascertaining the length of the pendulum vibrating seconds, in lat. 45°, at the level of the sea, for a proper unit of a new

system of measure. The English declined; the French appointed a commission to decide which should be taken of these following three.

1st. The length of the pendulum.

2d. The fourth part of the Equator.

3d. The fourth part of the Meridian.

The French people were in a bloody revolution, and being very radical about that time, even "to the changing of times and laws," they concluded to have

SOMETHING BRAND NEW;

and so they decided on a division of time, and weights and measures; they decided upon the quadrant for measure; that is, they plainly showed that their ways were devious, for they took a curved line as the measure of lengths; they resolved the 1-10,000,000th part of a quadrant of the meridian, the distance from the equator to the pole measured as along the surface of still water, should be taken for the basis of the new system, and they called the offspring, metre.

Now, the meridian was measured between Dunkerque and Barcelona, and it was not measured correctly; but what they obtained, viz.: 39,3707904 English inches was styled a *metre*, and adopted April 7, 1795, but it was not the metre intended.

Now, since it is plain that the French have adopted an incorrect, arbitrary measure of their own, simply because it is divided decimally, are we to blindly follow them at the dictation of a very few? The rulers of the inhabitants of a small state, about as large as Pennsylvania, adopted an incorrect, an arbitrary standard, for which the great States of the world, inhabited by the English-speaking people, are to sacrifice their measures!

The population of France is 41,000,000 ; that of the other governments which have had the Metric system forced upon them, 164,000,000 ; whilst the English speaking people are 100,000,000, and the dependencies are 156,000,000, and those of Europe not adopting, 100,000,000 ; and to whom must the teeming millions of Africa, Japan and China look for a guide in the future, to say nothing of the millions in North and South America? Must it be to the incorrect unit of the French nation? Must the 800,000,000 of the world adopt the unit of a little state which has put forth a pretended standard of correct measure—a devious one—whilst the truth exists and is attainable? I do not believe that our people, or the English people are ready for any such move. The adoption of the metric system of France means much more than an act of Congress. It means, by virtue of a vote of the American people at the polls. I do not mean by this any advocacy of states rights, as some might suppose, but I mean that in a change so stupendous, which is a revolution, Congress has not the power, except as the representatives may be instructed by a special vote at the polls on this particular thing.

If we change, let us change for a unit commensurate with some natural measure, if we have such a measure. We certainly have a polar axis which is straight.

It seems that had the French been a little more patient, and not been determined to abolish the Sabbath, and divide the time into tenths, they might soon have been able to have arranged with the English nation for an international standard ; but, unfortunately, they moved as Napoleon did against the German, alone, in his supposed might, and suffered the defeat of Sedan.

The English, more conservative, but moved by the French example, determined to make a unit commensurate with a natural basis, and took the simple pendulum length, beating seconds or mean time at London, in a vacuum at 62° F., found to be 39·1393 inches. The English had in 1758 and 1760 determined the length of the pendulum beating seconds at London to be 39·13 inches ; this is the basis of the United States. Soon after, these standards were destroyed by the burning of the Houses of Parliament.

THE LAST STANDARD MADE

from a copy by Mr. Baily, was 38·0 inches. This standard was legalized in 1855 ; a copy, No. 11, made at tem. of 61·7° F., and sent to the United States, is the actual standard of comparison here.

And thus it is stated that the latest verdict of science was adverse to the practicability of basing a system of weights and measures on any invariable natural unit of dimension.

It must not be supposed, because we attack the French Metric system, that we ignore the advantage of a decimal system. Certainly the advantage of a decimal system is of paramount importance, and there is no reason why we should not have a decimal system, deduced from our measure of inch, foot and yard, or multiples of our unit, the inch. Indeed, now we have our 100 ft. tapes, divided in 10ths and 100ths, and our scales for office work in decimals. We have the most convenient decimal money system in the world.

As a purely decimal system involves a very considerable change, it becomes of importance to know of what unit shall a new decimal system be composed. It is very

certain that the French one is incorrect; and as it is a radical departure from our time-honored system, it should not be adopted as ours. Now, as the inch, the foot and the yard have been handed down to us through successive generations, we may best believe that the foundation has a Divine origin, in whole or in part. Sir John Herschel has shown that 500,500,000 inches is the polar axis of the earth, and may be considered, quite properly, as natural a standard as the metre; and he has also shown that the correct relation between volume and weight may be found in the fact that a cubic foot of water weighs 1000 ounces. He says, that by slight changes of the units the relation might be made exact, and the inch become the 1-500,000,000th part of the earth's polar axis; and 25 such inches making a cubit equal to 1-10,000,000th part of the polar radius. Now, examine for a moment. Here is the inch, a standard unit handed down to us from ages and ages past, an earth-commensurable unit. Commensurable with what? Not with the curved *surface* of the earth, but with that part of the earth's dimensions which is straight and definite, viz: its shortest diameter.

Now compare 25 inches, the 1-10,000,000th part of the polar radius, the one and only polar radius, with 39°37'07.904 inches, supposed to be the measure of an arc or quadrant—where out of the infinite number of meridians?—why, passing through Dunkerque and Barcelona. A straight line unit is the natural one for measure of straight lines, not a curved one.

To those people who can clap their hands with delight, and laugh themselves into convulsions at the exhibition of "the mistakes of Moses," made by a peripatetic vender of amusing tales, it will not be popular to quote Sir John

Herschel, Piazzi Smyth, John Taylor or Abbe Moigno, but I am addressing myself to the earnest, thoughtful seeker after truth;—to those I say with all seriousness, not only search the Scriptures, but search the teaching of the Great Pyramid of Ghizeh, for in them we shall find the solution of the question now agitating the world upon weights and measures and many other things besides, to confound the wise and bring to naught the foolishness of the wicked.

It is not necessary for me to announce myself as the champion of these men. God has raised them up in this age in order to fathom the long hidden secrets of the Great Pyramid, and it is the profound conviction of my soul that the revelation of that great stone pillar will overthrow and scatter the infinite teachings and work of the present day as the chaff of the summer threshing floor. I have no hesitation in declaring that the dimensions of that Great Pyramid, whose mathematics, astronomy, engineering, architecture and masonry reach to and beyond the discoveries of the wisest of the wise of this enlightened age and generation, and touch the inspiration of Divinity itself, furnish a whole system of measures so nearly the same as those of our country and those of our mother country, that it takes a microscope to detect the difference, and which are the proper standard for the world. The pyramid or sacred cubit of 25 inches is a superior measure in every way to the metre of the French, is earth commensurable and logical. The Great Pyramid of Ghizeh speaks especially to us as Engineers. It is a monument to teach the beauty and value of accuracy. It is a model to us in our foundations, in the selection of our stone for inside and outside work; it is a model for us in its masonic construction, in the perfection and fitting of every stone

neatly joined together; in its cement; it is a model in its proportion, a mathematical and astronomical marvel. It is a model in its measures, it is a model in its finish, it is a marvel of symbolism, it is a prophecy. Let us praise the inspiration that has given such a monument and profit by its teachings. for it is to us it speaks more forcibly than to others; and I hardly think it worth while for us to rack our brains about hairs, nails, lips, gramme, litres, arc, steres, metre, deci, centi, milli, deca, hecto, kilo, myria and a host of other jargon. Let the French philosophers and their followers split hairs, whilst dividing up an imaginary arc for a straight line; strain at a gnat and swallow a camel, and let us improve upon what we have, the gift of the Almighty Father. To those gentlemen who have embarked in this contest on the French side, and to those who are waiting, with one leg on one side of the fence and the other on the other to see which way the cat jumps, I desire to call special attention to the fact that the French system could not have been successful without despotic power, and to succeed *here* it must be done at the point of the bayonet.

Some of the wisest and most learned minds of the world have given their judgment against it, not only in France and England but in our country. In France it was made compulsory, and so difficult was it that the law had to be relaxed so as to permit halves and quarters. In 1817 John Quincy Adams was commissioned in this country to examine into the desirability of adopting the French Metric system and reported against it. In 1864 the French Metric system was legalized in England, and in 1866 in the United States. "Hitherto shalt thou come but no farther, and there shall thy proud waves be stayed."

The fruit of the persistent attempts to get the endorsement of the various societies to the Metric system was a second onslaught upon Congress in this year. This body wisely calls upon the various heads of the departments for an opinion. Now mark the answers, gentlemen, carefully. Are not the opinions of these men to be carefully weighed? Amidst the scramble of the different societies of the country to butt their brains out in their emulation to be the first to rush in where angels fear to tread, with petitions to force the French Metric system upon the people of this land, it is quite refreshing to listen to the sober, earnest and wise words from the heads of the different departments at Washington, in accordance with the call of the House of Representatives, Nov. 6th, 1877, asking three questions as follows, and be it remembered that these questions were asked by suggestion of the Boston Society of Civil Engineers, which society carefully shelved the answers:

1st. What objections are there to making the Metrical system (French of course) of weights and measures obligatory, which use has been authorized in Governmental transactions?

2d. How long a preliminary notice is necessary for the same without detriment to the public service?

3d. What objections are there, if any, to making the same system obligatory between individuals, and what is the earliest date that can be set for such obligatory use throughout the United States?

To which the Secretary of State answers:

1st. The obligatory use of the system, as far as regards those countries which have wholly adopted the Metrical system, while of convenience and utility with respect to them, would be of no benefit with regard to

those countries which have not adopted it, and especially with Great Britain and other countries where our present system is now in use, with which countries the bulk of our foreign commerce is at present carried on.

2. That it would require two years for the obligatory governmental use in his department.

3. *He ventures to remark* that in France, where the system has been obligatory beyond the memory of the present generation, the tradition of the old system clings among the people and defies complete eradication. That in Spain where the Metrical system was adopted in government transactions and legalized for those of individuals, the innovation is practically disregarded and but partially conformed to by the Government, which is compelled to recognize the validity of the old standard. Is indisposed to recommend the obligatory use of the Metrical system in all transactions between individuals. He thinks it would take five years.

The Secretary of the Navy says:

1st. No objection, except it would involve a total loss of all charts and chart-plates now in use. It would be prejudicial to the free exchange and use of English charts, so essential to navigators.

2d. System would be adopted in the Department as soon as the necessary standard should be furnished.

3d. We should hold ourselves in accord with those of our own language, is the teaching of experience. A mutual disadvantage would be the result of the change. The geographical extent of these people forbids it, etc.

The Postmaster General says:

1st. It is objectionable on account of the expense and the lack of practical knowledge of the system by the post

masters and the public at large. The expense immediately would be \$124,788.00. The decimal system of our country corresponding in principle with the Metric system, the apprehension that losses, mistakes and annoyances would result from the adoption of the Metric system would be greatly lessened if not altogether abated were sufficient time given for familiarizing post masters and the general public with it now before discontinuing the old system.

The Secretary of War replies through the following officers :

1st. The Inspector General, who says generally and very pertinently :

"The compulsory change from the present system would be inexpedient, as involving a large outlay without any adequate results."

The Quartermaster General, who brings to bear upon this subject a mind of rare ability and experience as well as that of a soldier ready to obey, says :

If the *law* makes the use of the Metric system obligatory in all Government transactions it can be adopted by officers of the quarter-master department as soon as notified by general orders.

1st objection. It will very considerably increase the labor of computation, as all old measures and weights will be translated into the new in all statements of vouchers, receipts and accounts, which will be perfectly useless labor.

2d. Will infallibly cause mistakes and result in loss to the disbursing officer or to the person who sells supplies to the United States.

3d. It will require the loss of all hay and other platform scales and the substitution of new ones, which will be expensive.

4th. If obligatory upon the Government and not upon individuals, then confusion and misunderstanding will be caused by the use of one standard by the Government and another by the people.

The transactions of the Government are insignificant in comparison with those of private trade and manufacturers and consumers, and the people will not change their customs at the call of the officers of the United States.

In regard to making the Metric system obligatory in transactions between individuals :

I do not believe that this is within the power of Congress. It will be looked upon by the people as

AN ARBITRARY AND UNJUST INTERFERENCE

with their private business and individual rights, and I do not think they will submit to it.

It will inflict, if it can be enforced, great loss upon many, especially upon manufacturers and mechanics whose shops are filled with costly tools, standard gauges, dies and machines, all constructed upon the basis of the foot and inch. Every geared lathe in the United States depends upon a screw of a certain number of threads to the inch, and all the screws it produces are gauged in pitch and diameter by the inch.

The metre is not commensurate with the inch, foot or yard; all reductions are approximate only. The law of July 27th, 1866, makes use of the metric system permissive but not obligatory, and establishes for the reduction of metres to inches and the reverse, the ratio of one metre to thirty-nine and thirty-seven hundredth inches, which is not absolutely correct.

To alter all of the machines, engines, etc., will be the work of years and cost millions of dollars.

The Metric system is not a convenient one for common use. The yard, half the stature of a man, is of convenient length to handle, to use, to apply; it and the goods measured by it, can be halved, quartered, sub-divided into eighths, sixteenths, thirty-seconds, sixty-fourths, etc., or it can be with equal facility divided into tenths, hundredths, thousandths.

Half a meter is no dimension; half a centimetre is an unknown quantity, but half a yard, half a foot, half an inch, half a bushel, of a quart, of a pint, etc., are recognized.

If half a liter, of a delitre, or a quarter, eighth, or sixteenth of these quantities is provided for, then the metric decimal system is abandoned at once.

The decimal system is one our country applies admirably to money, but even here the Government has been obliged for the convenience of the people, to use half and quarter dollars and eagles. In the use of weights and measures, however, there is not so great advantage in the decimal system. The unit is too large, and the numbers produced and used in the calculations of engineers are tedious to write and are beyond limits of ready apprehension.

The ciphers and figures 0.00000073 convey no idea to a mind trained in the English and American system; yet such combinations are common in French works of science and mechanics.

The true scientific natural basis of the Metric system has been abandoned. The metre was intended and enacted to be the ten-millionth of the quadrant of the terrestrial meridian of Paris. In the progress of geodesy and science, it is ascertained that the standard metre bears no exact relation to that quadrant; and although it is prob-

ably very nearly the ten millionth of the quadrant of the meridian in which New York lies, it is not probable that it is the ten millionth of either of the three other quadrants of that meridian or of any quadrant of any other meridian?

The fact is that the metre is quite as arbitrary and unscientific a standard as the foot or yard. It is of less convenient length than either of them, and its compulsory adoption would derange the titles and records of every farm and of every city and village lot in the United States; would put every merchant, farmer, manufacturer and mechanic to an unnecessary expense and trouble, and all it seems to me for the sake of indulging a fancy only, and a baseless fancy, of closet philosophers and mathematicians, for a scientific basis of measures and weights, which (as the metre is not the ten millionth part of the Paris quadrant, is not what it professes to be and was enacted to be) can not be found in the French Metric system.

1. The unit of length, the metre, is $3\cdot280890+$ feet or $39\cdot37079+$ inches.

2. The unit of area, the arc, is $119\cdot60332+$ square yards.

3. The unit of liquid measure, the litre, is $0\cdot26418635+$ gallon, or $1\cdot0567454+$ quarts, or $2\cdot1134908+$ pints.

4. The unit of space, the stere, is $1\cdot308764+$ cubic yards, or $3\cdot5386636+$ cubic feet.

5. The unit of weight, is the gramme= $15\cdot43234874+$ grains troy.

6. The unit of roods, is the kilometre= 1000 metres= $0\cdot62138+$ mile.

7. The unit of land measure for farms and city lots is the hectare= $2\cdot47114+$ acres.

8. The commercial unit of weights, is the kilogramme= 1000 grammes= $2\cdot20462125+$ pounds avoirdupois.

What will our farmers, citizens, tradesmen and mechanics do with these figures? and will they submit to being obliged to reduce acres, feet, inches, pounds and ounces by multiplying or dividing by the above figures?

I think that to make the French Metric system obligatory between individuals in this country will be an impolitic and arbitrary interference with the rights, interests and habits of the people.

The Surgeon General reports:

1st. As to the first, the gravest inconveniences would immediately result from the attempts to render obligatory upon Government officers the use of a system of weights and measures which are so entirely different from those which have heretofore been and would *then continue to be*, in general use among the people. Leaving the subject of its use in land measurement, in Government workshops, where the most deplorable results would ensue from the Government using a different standard from the people, he confines himself to the disastrous inconvenience resulting to the Medical department of the army from the measure in question. This, he says, would require the substitution of the Metric system for apothecaries weights and measures in use in the United States.

In all medical and surgical works of any importance printed in the English language the doses are expressed in apothecaries weights and measures. The immediate effect of compelling medical officers of the army to substitute the metrical weights and measures, would be to force them to make a series of arithmetical calculations every time they attempt to use the prescriptions or doses laid

down in any medical work written in the English language. This thankless and unnecessary labor would waste much precious time, and an error might cost life. A revision of the Pharmacopœia would be necessary, and then a corresponding revision of all medical works before the Pharmacopœia could be conveniently used. The interests of sick officers and soldiers require perfect accord between the military and civil profession. The change therefore would be fraught with the most unfortunate consequences.

2. It is time enough when the profession has asked for the change for it to be imposed.

It would be less onerous if universal in the country, but great public inconvenience would result if the system were made obligatory. It would be out of harmony with the English speaking people. This might be lightened by its adoption by Great Britain and the United States simultaneously. Unless an international arrangement could be effected, it would be wiser for the friends of the system to remain content with the law legalizing the use of the French system. If it possesses the advantages claimed for it, surely it will be made manifest; if the people will not employ it of their own accord its *enforced introduction would be a great public wrong.*

The Commissary of Subsistence reports:

1. It would involve not only great confusion and great extra labor, but the people would look with grave suspicion upon Government transactions based upon a system of weights and measures which they did not understand. To adopt the system by the Government would remove it farther from the people, weaken, if not destroy their confidence in Government officials.

2. It would be also inexpedient for the Government of the United States to make the system obligatory between individuals, unless in co-operation with Great Britain, with whom we are so intimately connected by language, literature and commerce.

It would require a great effort, and long preparation, say twenty years; and even with the most thorough preparation, the change when made will bring with it almost *inextricable confusion* and well nigh *intolerable inconvenience*, however superior to the existing system the metrical system may be, by reason of its decimal character, its symmetry, and its consequent simplicity.

The Paymaster General:

Legislation should begin by making the Metric system obligatory, in certain (not in all) Government transactions. In collection of customs, in the postal system, and in fixing rates of coinage, and in all international transactions, it should now be made obligatory from the first of July, 1879. I do not recommend its adoption in the land system, and in the purchases for the army and navy at so early a date.

By this proposed legislation, a stimulus would be given for the system being taught in all the schools, so that in *six years* the rising generation would be initiated and accustomed to it.

It would be time enough then for legislation making its use obligatory in all remaining Government transactions."

This is very much like French in six easy lessons.

The Chief of Engineers reports:

There is no other reason except inconvenience why its use should not be compulsory by the officers of the Engi-

neer Corps, provided sufficient time be given. Five years is a minimum to allow for the proper careful manufacture, comparison and distribution of standards, and their duplication in various forms for ordinary use; for the necessary changes in tables and formulas, and more especially, to allow a sufficient interval of time during which a practical familiarity with the new standard may be acquired, particularly by those with whom the business of the engineer's department is transacted and who are in the public service, as well as by those not in the public service who use the maps, charts, etc., of the department.

In regard to the compulsory use of the system between individuals, there is nothing in the proposed change which will in any way *favorably* affect the usual course of private business in this country. The demand for change does not come from business men, but it is made in furtherance of a project designed for the general public good in international intercourse.

There is no pressing necessity for immediate change, and it would undoubtedly be better if the change *should* be made to make it by concerted simultaneous action on the part of all English-speaking people. Without this accord it would be extremely undesirable.

As to the general question whether it be desirable to adopt a *decimal system* of weights and measures, there will probably be but little difference of opinion, since its adoption will to some extent simplify existing tables and tend to establish uniformity throughout the world.

As an actual practical fact, its adoption is a matter of no immediate importance, and certainly should not be made obligatory upon individuals before it has become generally understood, by being adopted in the Government service and taught in all its public schools.

The French decimal Metric system has been adopted and made compulsory in France, Belgium, Holland, Greece, Italy, Spain, Portugal, Germany, Columbia, Venezuela, Ecuador, Brazil, Peru, Chili, and the Argentine Confederation and Uruguay.

Great Britain and the United States have legalized the system, but have not made it compulsory. Switzerland, Denmark, Sweden and Austria, use partial decimal systems, but with different units of length and of measure.

It is very plain from an analysis of these reports and opinions that the convictions generally of these officers is emphatically pronounced against the introduction of the French Metric system into this country; nearly all think it disastrous, unless conjointly with Great Britain.

It is very evident that none of the officials of this country are pressing this matter; does it then come from the people? No, not from the people; and when we sift the whole matter we shall find that this movement has been concocted by a band of men as dangerous as the young man whose advice Rehoboam took, and the result of which will be as fatal and disastrous to the country, should they succeed, as was the result of that advice.

The advocates of the system hesitate not to ridicule the opinion of those honorable men whom I have quoted. As to Professor Hilgard, Surgeon Barnes, General Meigs, Secretary Thompson, General Humphrey, the Commissary General of the Army, the Chief of Engineers, John Quincy Adams, Professor Greaves, John Taylor, the Astronomer Royal of Scotland, Howard Vyse, Sir John Herschel; the little finger of these is greater than the thighs of the whole of these old fogies put together; so think they. To be sure, there is a little "lion" in the path, but that is easily

overcome. "When our builders, and contractors, and architects, and engineers, and grave diggers use this system," and the strong arm of the government says you *shall* use it, how easy it will be, and how triumphant will be our success, say they. So did *they* in 1792, when with the proposed innovation they invented the beautiful new *decimal system*, so called, of days—12 months of 30 days, and the thirty into three tens; there is the key, and every tenth a what? A rest day. And what of the five other days of the year. Why those are called the *sans cullotidides*, festival days.

Now how long did that lovely system last? Just fourteen years, a prophetic number, to show the French people that it could not last more than two weeks of true sabbatic time, and then in 1806, down went No. 1.

Now, my friends, when the grave diggers begin to measure our last resting places by the Metric system, then understand that the curse of the Almighty may crush it just as He did the impious attempt to abolish the Sabbath.

The adoption of this system would be a law to put in the hands of a ring the making of all Metric standards of weights and measures; a ring doubtless already inaugurated and sitting like a great vulture ready to pounce upon its lamb-like prey. It will be a law to establish a ring to make all of the Metric scales of the country, so that no man might buy nor sell unless they had this mark of the beast upon him. It will be a law to establish a ring to change all of the Government maps, records, measures, and to prescribe them for the people, that no man might measure except he had the same mark.

It will be a law to form a ring to sell all the proceeds of the farmer, and the poor mechanic and laborer, that

the rich may become richer and the poor poorer.

It will be a law to form a ring to change all the medical and surgical books, that no man might print or publish unless he had the mark of the same beast. It will be a law to fill our graveyard with untimely graves. It will be a law to flood the country with quacks of every description, legalized to measure and kill according to the Metric system, flooding the country with cormorants who will destroy its substance with useless and indeed damnable litigation.

In fact, it will be a law to produce confusion worse confounded, to make a very Babel of the whole earth, and finally result in an uprising, which will exterminate, in a battle, the whole horde of leeches, monopolies, rings and excrescences of every kind, which would, and indeed now to a great degree do, mar the beauty of God's earth.

It is plain that the introduction of this system into our country will be very detrimental to the poor man everywhere; it will be especially a curse to the farmer, and it will necessitate a great number of lightning calculators to be spread through the West to prevent a deliberate cheat or an unintentional error.

When the English Parliament was in laboring pains upon this great question in obedience to a claim as senseless, from people as designing, weak and ignorant as those who are burning midnight oil writing and petitioning to members of Congress for heaven's sake to hurry up and compel the people to adopt the French Metric system, the Astronomer Royal of Scotland, Piazzzi Smyth, in his report, informed the committee that the said forcible introduction of foreign weights and measures into Great

Britain would be to the *excessively great inconvenience* of 9,999 persons out of every 10,000 of the population, and the gain to the one person in 10,000 only small; and that any interference of Government for compelling the use of foreign measures in ordinary retail business of the country would be *intolerable*; that they could not enforce their penal laws in one instance in a thousand, and in that one it would be *insupportably oppressive*.

The London Times wrote at the time of this subject:

"A very great trial is impending over this free and happy country. It is not the loss of our cotton trade, of our colonies, of our prestige or our maritime supremacy. It is a change from our hereditary weights and measures, that would strike far deeper and harder than any of these; for there is not a household it would not fill with perplexity, confusion and shame."

Sir John Herschel writes as follows:

"*Editor of the London Times:*

Sir: As Mr. Ewart's bill for the compulsory abolition of our whole system of British weights and measures, and the introduction in its place of the French Metric system, comes on for its second reading on the thirteenth prox., I cannot help thinking that a brief statement of the comparative *de facto* claims of our British units over the French, on abstract scientific grounds, may, by its insertion in your pages, tend to disabuse the minds of such, if any, of our legislators who may lie under the impression (I believe a common one among all classes) that our system is devoid of a natural or rational basis, and as such can advance no *a priori* claim to maintain its ground.

De facto, then, though not *de jure* (*i. e.* by no legal definition existing in the words of an Act of Parliament, but

yet practically verified in our parliamentary standards of height, weight and capacity as they now exist,) our British units refer themselves as well and as naturally to the length of the earth's polar axis as do the French actually existing standards to that of a quadrant of the meridian passing through Paris, and even in some respects better, while the former basis is in itself a preferable one. To show this I shall assume as our British unit of length the imperial foot; of weight the imperial ounce; and of capacity the imperial half pint; and shall proceed to state how they stand related to certain prototypes which I shall call the geometrical ounce and half pint, and shall then institute a similar comparison between the French legally authenticated metre, gramme and litre in common use with these (equally ideal because nowhere really existing) prototypes supposed to be derived from the Paris Meridian quadrant, distinguishing the former as the practical, the latter as the theoretical French units.

Conceive the length of the earth's axis as divided into five hundred million equal parts, or geometrical inches.

Then we next define, First, a geometrical foot as twelve such geometrical inches; Second, a geometrical half pint as the exact hundredth part of a geometrical cubic foot; and Third, a geometrical ounce as the weight of one exact thousandth part of a geometrical cubic foot of distilled water, the weighing being performed as our imperial system prescribes, in air of 62° Fah. under a barometric pressure of 30 inches.

In like manner the theoretical kilogramme and litre of the French are decimally referred to their theoretical metre or their own peculiar conventions as to the mode of weighing.

This premised, First, the imperial foot is to the geometrical foot in the exact proportion of 999 to 1000, a relation so numerically exact that it may be fairly considered as mathematical; and second and third, the imperial half pint and ounce are each of them to its geometrical prototype as 2600 to 2601.

Turn we now to the practical deviations from their theoretical ideals in the case of the French units. Here again (1) the practical metre is shorter than its theoretical ideal. The proportion is 6.400 to 6.401. The approximation is indeed closer, but the point of real importance is the extreme numerical simplicity of the relation in our case, more easily borne in mind, and more readily calculated on, in any proposed case. (2) and (3) any error in the practical value of the metre entails a triple amount of aliquot error in the practical kilogramme and litre, so that, in the cases of the three units, the proportion between their practical and theoretical values is not that of 6.400 to 6.401, but of 2.133 to 2.134.

Here, then, the greater degree of approximation is in our favor; and it is to be observed that in our case, this triplification of error does not hold good, since by a happy accident our standard pound had been fixed quite independently of our standard yard, and our gallon is defined as ten pounds of water.

JOHN HERSCHELL.

It is very evident that Sir John Herschell did not look with favor upon the Metric system, and where can we find a wiser head. But the advocates of the system seem to care nothing for those men nor for their opinions.

It is astonishing what a superhuman force the Devil exerts in attempting to accomplish a vital point. He brings the most specious arguments, ridicule, threatenings

and lies to his aid. When the advocates of the system went to Russia to induce that power to accept it, they said: "*and England is just about to adopt it.*" That they thought was a clincher; and now they will tell you here, and do tell you, "Why *Russia* is just about to adopt it and *England* also; and, surely, it will never do for this enterprising young country to be behind, for you know that the Devil will take the hindmost." But, gentlemen, allow me to say that I have it from most excellent authority, in a letter from a distinguished citizen of Great Britain, from which, just received, I have been permitted to quote: "*That Russia has not adopted and does not intend to adopt the Metric system.*"

And he says: "assure your countrymen that the threatened descent of Great Britain into the bottomless pit of atheistical French Metricalism was stopped by Lord Beaconsfield's Government when they came into office; and, also, that the snares that had been laid in our public school systems have been rooted out by Lord Sandon, with a high hand and determined spirit. And he adds these words: "*If other countries are going helter-skelter down the road to atheistical ruin, it is happily the spirit of the Pilgrim Fathers which keeps, and we may hope always will keep, America the last in such a negative and suicidal race as that.*"

Ponder upon these words, ye Representatives and Senators of the Nation. Ponder upon them, ye school boards throughout the length and breadth of this blessed land. Ponder upon them, ye sons of Plymouth Rock and Marblehead; ye of the land of Washington. Ponder upon them, my companions and friends of the Societies of Civil Engineers of this country; and choose ye this day whom you will serve.

From the Boston Society of Engineers' standing committee's report upon the Metric system of weights and measures we may gather the sum of progress made towards the adoption of this system.

They report that the Boston Society, the New Jersey State Medical Society, the New Haven Engineering Society, the Cincinnati Society of Natural History, the Medical and Chronological Faculty of Maryland, the Society of the Massachusetts Institute of Technology, the Boston Society of Medical Science, the Boston Society for Medical Observation, the Ohio Association of College Officers, have either sent petitions to Congress, or will so do, praying for the exclusive use of the Metric system in various branches of the Government service after some future date.

You will notice, gentlemen, that there is not a single Granger Society, not a Mechanical Engineering Society, not a farmer, not a mechanic, nor a merchant among them; and I am thankful to say, too, that the American Society is not among them.

But what does the committee say of the action of that society? They say: "The American Society of Civil Engineers by letter ballot canvassed February 6th, 1878, 'Resolved, That the further consideration of the Metric system in weights and measures be indefinitely postponed;' " and the committee add: "We think, ourselves, that the further consideration of the advisability of adopting the Metric system may be superfluous, regarding its ultimate use all over the world as a foregone conclusion; but we believe it worth while to study the best method of introducing it."

This is as much as to say that it matters not whether

the American Society of Civil Engineers recommends it or votes for it or not, it will be adopted all the same.

I honor the American Society for its conservative action upon the subject, and I will venture the prediction that this society will have reason to be proud of the resolution quoted; and I have an abiding faith, also, that it will likewise stand to it in letter and in spirit.

Gentlemen, I honor the excellent, earnest, wide awake, and most hospitable society of Boston. We speak of the latter from grateful experience. I honor the headquarters of that fine society, Boston; the Athens of America, the Bethlehem of the New World, the home of the fathers of that wonderfully symbolic stone, Plymouth Rock, and of its no less distinguished Marblehead; but, I am reminded by that book which was their guide, and strength, and shield, that even in the garden of Eden the serpent found its way. It is always so; the Devil seeks the very fountain head, the very garden spot of Paradise in which to sow his seeds, and I am not therefore surprised that he has appeared among the Boston Civil Engineers and now seeks to seduce them into the advocacy of this godless system, and thus deceive the very elect; but, although from a more Southern clime, I have too much faith in our Pilgrim Fathers and their worthy descendants to believe that they will allow themselves to be utterly overthrown by this new development of Satan's power.

This committee, however, are acting speciously indeed and I warn you to observe:

The society memorialized Congress, not unwisely, on the 17th of October, 1877, for the passage of a resolution inquiring of the heads of the executive departments what objections there are to the adoption of the Metric system

in the Government business, and in private transactions; and how long a time should be allowed for such adoption.

Now, observe: the committee inform the society that their answers *are filed in the library* of the Society, and the only very meagre mention of these very valuable opinions and reports which the committee makes, is such as suits their side. They say of the Surgeon General's report: "he *thinks* that the adoption of the Metric system would be fraught with great danger to the sick soldiers." "While on the other hand," the committee says, "the sick sailors are being dosed according to it; the Metrical Purveyor of the Marine Hospital service having introduced it last year." But, the committee does not say by whose authority this officer has done this, nor can tell how many dead sailors there are from this unauthorized act, for dead men tell no tales; and he fails to quote what the Secretary of the Navy, the superior officer of the Purveyor, says. Neither do they tell you that the Surgeon General says that the change would produce the most deplorable consequences. Neither do they tell you, when quoting part of the words of the Chief of Engineers, all on one side, that he said this: "That the relations of trade between this country and Great Britain are such that the adoption of new standards of weights and measures by the one, without the current action of the other, is extremely undesirable. As an *actual practical fact*, its adoption is a matter of no importance," etc. They do not tell you that the Quartermaster General said: "*I do not believe that this is within the power of Congress.*"

Now, gentlemen, why did not this committee lay before the society a synopsis of these opinions and reports which I have quoted, in order that the whole subject could be

digested with the aid of consultation and investigation?

Need I apologize, then, when I say that there is a serpent in this Garden of Eden, in this Athens of America?*

Gentlemen, you may rely upon it that those Pilgrim ancestors of yours are not resting easily in their graves on account of your action. They were sticklers for Magna Charta, they loved just weights and measures; and the words of John Quincy Adams, delivered in 1817, are just the words they would give you now. I beg you not to make the mistake of taking the advice of the young men, and ignoring the counsel of your fathers. Think for a moment. This system came out of the "Bottomless Pit." At that time and in the place whence this system sprung it was hell on earth. The people defied the God who made them; they worshiped the Goddess of reason. In their mad fanaticism they brought forth monsters—unclean things. Can you, the children of the Pilgrim Fathers, worship at such a shrine, and force upon your brethren the untimely monster of such an age and such a place?

Surely not.

Say rather, "Oh! my soul, come thou not into their secret."

But what is to be done? many are ready to ask. What is better than to accept the ingenious and beautiful, as well as convenient, system of the French?

If we look abroad we can see no evidence of decay in our civilization or prosperity, or diminution of our business

*I learn since this paper was put in press that at the last meeting of this society only eleven members out of eighty were present. Eight voted for a memorial to Congress praying for the compulsory adoption of the Metric system. The dissenting three were not allowed to be recorded against the measure in the memorial. Such is the method by which societies are represented as petitioners before Congress.

because we have not adopted it. Certainly, our Centennial² exhibited a most wonderful spectacle; and did we notice that the French were in advance of us? Is their flag seen on every port on the face of the globe because of their superiority of measures? Is not the "*Anglo Saxon world*" in advance to-day? What superiority or advantage can the French point to on account of their system? *None whatever.*

But it is true that our weights and measures need remodeling; but how shall it be done? Not, surely, by uprooting all of our traditions—cutting ourselves loose from the past. No we must come back to the *perfection* of the past; and where shall we look to find it? I answer, in the Great Pyramid of Ghizeh.

It has been proved by those eminent men who have been mentioned as the students of the Great Pyramid, that there is found within this great pillar of stone the standards of weights and measures, earth commensurable, and so assimilated to our own ancient hereditary system that it does seem as if the Almighty Himself had given them to us as an inheritance, to be kept precisely for the emergency of the present day and hour. And I beg that our American fellow citizens will most carefully examine into this subject, deeply worthy of their consideration.

Shall, we indeed, truly find our weights and measures there? I can confidently answer that they are there. The inch is there; the yard is there; the cubit or arm of 25 inches is there; our year is there; our Sabbath is there; Christ is there; our past, our present, yea, perhaps our future.

And if so, what better standards can you have than those which have stood the mutations of all the Empires.

of the world for 4050 years, with its fires and floods, its lightnings and earthquakes? What better measures than those which stand to-day engraved in the rock forever with a skill and perfection and polish equal and superior to the finest jewelry work of the present day?

But is the *decimal* system of weights and measures really there? Certainly; none more decimal. Why, the very name of the great pillar of stone announces its proportions—*Pyr*, the Coptic for division; *met*, ten—*Pyr-a-met*, *divisions of ten*.

The sun's distance, discovered by Mr. Petrie in 1867, and ridiculed from that time until the result of the last observation of the astronomers of the world, has been proved correct; and the French savans have had to cry: "The Pyramid has conquered."

But what evidence have we that the Pyramid is a symbol of measures? It would take a volume now to record the discoveries in that direction made since John Taylor first announced his discovery in 1859:—that the Great Pyramid was built as an enduring standard of weights and measures.

But is this all? The rapid strides made by the measurements and discoveries of Professor Piazzzi Smyth, the Astronomer Royal of Scotland, and others, in unveiling this sacred monument, show that it is far more: It is a symbolic stone, a record of the past, a prophecy of the future; a symbol of that stone kingdom cut out of the mountain, Christ's kingdom, which has smitten, smites, and is to smite, with its mighty power, the false systems of the old world, and grind them to powder.

When a man or a nation adopts a seal, it is understood that the most significant of all emblems is placed thereon.

We look to the seal to give us the clue to the origin or genealogy of the wearer or owner. It is as the banner, it is the sign, the pledge.

We say "there is a divinity that shapes our ends, rough hew them as we may;" surely a divinity directed the hand and inspired the mind that wrought our seal—that of these United States—a pyramid unfinished, with the all-seeing Eye above it, reminding us, perchance, of the rock from whence we were hewn, and of that Omniscience which has guided us and brought us to our present glory and honor as a nation; reminding us, too, that we must *look* to that wonderful monument of stone for our origin, our history; indeed, our weights and measures.

The great eye is there, above the monument, saying, as plain as symbols can speak to us: Look to the Pyramid!

What other nation has such a seal? Now, when infidelity rears its hideous head—when the measures of the "bottomless pit" are being forced upon us—when all that is sacred, all that is holy, is being denounced and trampled under foot—it behooves us, as children of that great seal, to study its significance, and see if it does not point us to the rock whence *we* are hewn, and teach us to stand firm against the flood of infidelity and worldliness which is sweeping over the nations.

Will the Great Pyramid speak to those whose measures are not there? Will a symbolic stone speak its language to those who have thrown away the key—their tradition?

The Pyramid speaks in inches. Will this be intelligible to those who have thrown away their birth-right and speak only in metres?

What inheritance in the Great Pyramid have those nations or peoples who have thrown away their traditions

—*i. e.*, destroyed their old measures—and made it a penal offense to use any other than the French Metric system?

Many years ago, when lying in the port of Montevideo, where I met and made the acquaintance of many French naval officers, one day they gave me a French puzzle—a favorite one in the Polytechnic Schools of France. It was this: You are placed in a marsh where reeds only grow, and you are to feed yourself mathematically—that is produce something in mathematics which will make a meal.

I gave it up, and it was explained thus: You take a reed (*jonc* in French) in your hand, and with it, a radius, describe a circle. The value of the circumference of the circle is twice π into Radius—that is, in the French, $\text{Deux } \pi \times \text{jonc}$, or Deux Pigeons—two pigeons; and so have your mathematical meal.

Pondering upon this one night, in connection with the height of the Great Pyramid in inches—viz: 5813—suddenly the French puzzle came into my mind, and I multiplied the height of the Pyramid by 2π , that is $2 \times 3,1415926$, and lo! I had 365.2422+; precisely 100 times the number of days, and portions of a day, in the year, according to the nicest astronomical calculation of this day—that is, I had a circle of which 1-100th part was 365.2422+, which symbolizes the days and fractions in a year. Now, divide this circumference by 4, and what have we? Just 9131.055 inches, the exact base side of the Pyramid.

Then it suddenly flashed upon me—What inheritance have the nations in the Pyramid which have cast off their inch? Will this false meter give them this result? Never.

The Polytechnic Schools of France may get their Deux Pi-gons by the meter; but they have no part nor lot in the sacred cubit nor inch of the Great Pyramid, nor are

they permitted to use the measures. Will *you* also give up your birthright?

But I suppose many here are ready to say: Well, that is but a coincidence—curious indeed—but an accident of the very form of Pyramid taken. Well, if it be an accident that the Pyramid architect divided the days and fractions of a day, multiplied by 100, how is it that any of the sides of the base of the same, divided by 25, will give you the days and fractions of a day in a year?

But, you say, the one follows from the other. Well, let us go inside. We find that the length of the ante-chamber floor is 116·26 inches, and if we multiply that by 3·1415926, we get again the days and fractions of a day in the year. Is that also an accident?

Multiply 116·26 by π and by 25, we have the base side length of the Pyramid. Does this also follow? Well, let it be so, if you please, until we look farther.

The ante-chamber floor is 116·26 inches long. Let us multiply this by 50, the course of masonry upon which it stands, and we have the height of the Pyramid, 5813 inches. If we multiply 116·26 by 2, we have a number equal to the height of the Pyramid in cubits of 25 inches.

But the ante-chamber floor is composed of 103,033 inches* of granite and 13·227 inches of limestone. Let us take this 103·033 as a measuring-rod and go into the King's Chamber. It is 412·132 Pyr. inches long. This rod goes into the breadth of the floor exactly twice, into its length exactly 4 times, into its height 2·236, which is the square root of 5. The sum of the squares of these numbers, 4, 16 and 5, is 25, which is the length of the sacred cubit.

*In speaking of inches Pyramid inch is meant. The Pyramid inch is one-thousandth of an inch greater than the English inch.

This rod will go into a diagonal of the end wall of the same chamber three times, into the diagonal of the floor 4·472 times, into the diagonal of the side wall 4·582; the squares of which are 9, 20 and 21, the sum of which is 50 inches or two sacred cubits.

The same measure is contained in the solid diagonal of the whole King's Chamber, 515·165, or from one corner to opposite corner, just 5 times, the square of which is 25. The sum of these, 25, 50, 25, is 100 inches.

Now, the 412·132 inches, the length of the King's Chamber, is the diameter, in cubits, of a circle whose area equals a square having 365·242 cubits for the length of its side, or just one Great Pyramid base side.

A square of 412·132 cubits for the length of one side is equal in area to a circle whose radius is 232·520 cubits, or the height of the Pyramid.

Measure the vertical height of the Pyramid to the 35th course of masonry, and you have 1162·6 inches, or ten times the ante-chamber length; measure horizontally from this point to the outside, and you have 3652·42, or ten times the number of days and fractions of a day in a year, or just one-tenth of the base-circle obtained by proportion of Deux Pigeons:—

$$1162·6 : 3652·42 :: 1 : 314159+$$

Now, I have mentioned before that 500,000,000 Pyramid inches is the diameter of the earth. As the remarkable number, 5813 inches, the height of the Pyramid, symbolizes the polar axis of the world—points heavenward—let us see what it teaches.

If we multiply twice this height, or 116·26, which is also one hundred times the ante-chamber length, by 500,000,000 inches, and reduce it to miles, we have 91,745,580

miles, or almost the same as the last obtained sun's distance by the best astronomers of the world. This is obtained also by doubling the polar diameter in inches and multiplying by the height in inches; or, what is the same, multiply 10," the ratio of the rise of the Pyramid to the distance to center on the diagonal, by the height of the Pyramid in inches, 5813.

The Great Pyramid speaks to us, also, in the proportion of 5's; its five angles, five sides, five corners. It speaks to us in the purest mathematics, a language of all nations and all peoples; it speaks to us in its π proportion. Ludolph Van Kenlen, of Holland, was so enraptured over the discovery of this π proportion of diameter to the circumference of a circle, in 1590, that he had the figures carried out to 36 decimals and engraved on his tombstone; and yet the proportion was known to the Great Pyramid builders over 4,000 years ago. No evolution here.

The height of this Great Pyramid is to twice its base as 1 is to π , or 3.1415926+

Many have asked Piazza Smyth this question: What about money in the Great Pyramid? And at the meeting of our club in Chicago some one asked me this question: If the weights and measures are God-given, and are not to be changed, why then did our forefathers make a new scale of money—a decimal system—founded upon no known values of the past.

Well, I think that when the question is thoroughly analyzed and its depths measured, we shall find that even here there is a symbolism in the ancient monument which will tell us that we have unearthed some of the treasures of the past—that even these "were written in the rocks."

The following, from the *Scientific American*, is an apt illustration in point here:

"UNITED STATES COINAGE AND THE GREAT PYRAMID.—We are indebted to Watson F. Quimby for the following letter, wherein he ingeniously points out a most curious analogy between the measurements and weights of the Great Pyramid and those of *our several coins*.

"Dr. Quimby says: 'In the admirable work of Professor Piazzzi Smyth, entitled, "Our Inheritance in the Great Pyramid," it is shown that the Great Pyramid of Egypt contains in the interior, standards of inch measure, while the exterior gives the same standards in the sacred cubit of twenty-five inches. One of the most important units of measure is the length of the so-called King's Chamber, which is 412.5 English inches, and its breadth 206.2 inches.

Now our silver coinage corresponds to these numbers, as the "dollar of the fathers" weighs 412.5 grains, the half-dollar 206.2 grains, and the quarter-dollar 102.1 grains, which last is a very important Pyramid number. On inquiry at the mint why the silver dollar was made of this weight, I was informed that it was the weight of coin that would readily pass current in the Eastern Asiatic trade. It is therefore a traditional coin, by whatever name it may have been known for thousands of years.

But not only does the silver coinage correspond to the inch standard of the Pyramid, but our gold coinage corresponds to the cubit measure. The height of the Pyramid in sacred cubits is 232.5, and our gold eagle, the unit of gold coinage, weighs 232.2 grains, and the half-eagle 116.1 grains.

The relation of these numbers is such that the area of a square having 103.03 on the side is equal to the area of a circle having 116.26 for its diameter.—*Philips*. Now, as there are 360 degrees in the circumference of a circle, its diameter in terms of seconds is 412,529, and its circumfer-

ence is 1,296,000. Then the number 412'5 is the thousandth part of the diameter of a circle in terms of seconds; and 1296, the number of square inches in an English yard, is the thousandth part of a circle in terms of seconds. This at once connects English with Pyramid measure, and may indicate the origin of both.

From the standard square yard all the rest of our measures may be deduced. The old English gallon, 231 cubic inches, which is a number immediately between the height of the Pyramid in cubits, 2325, and the height of the King's Chamber in inches, is 23089. The diameter of a circle is to the side of a square of equal area as 9 to 8, very nearly—

$$9 : 8 :: 116 : 103.132.$$

It thus appears that in the weights of the quarter-dollar and the half eagle we have had the squaring-of-the-circle problem typified without knowing it!"

I have given a few tables presented in "Our Inheritance in the Great Pyramid," as examples for the general reader, and to show how extraordinarily the proportions of the Coffers are assimilated to our system. For details of the system I refer to the larger works—editions of 1864, 1874, 1878, and the edition of 1879, now in press.

PYRAMID CAPACITY MEASURE.

Division or Number of each denomination contained in the whole coffer.	Inter-mediate division.	Capacity of each denomination in Pyramid cubic ins.	Equivalent weight in Pyramid pounds of water.	Name now proposed to be given to each successive portion.
1	.....0.	71,250.	2,500.	.....coffer
4	.....4.	17,615.	625.	.....quarter
10	.....2.5...	7,125.	250.	.....sack
25	.....2.5...	2,850.	100.	.....bushel
250	.....10.	285.	10.	.....gallon
2,500	.....10.	28.5	1.	.....pint
25,000	.....10.	2.85	0.1	Wine glass or fluid oz.
250,000	.....10.	0.285	0.01	Teaspoon or fluid dr.
2,500,000	.....10.	0.0285	0.001	.....ten drops
25,000,000	.....10.	0.00285	0.0001	.....drop

PYRAMID WEIGHT MEASURE.

Division or No. of each part contained in Weight Standard.	Inter-mediate Division	Weight of the part so divided in Pyramid lbs.	Capacity of the parts in Pyr. cubic in. of earth mean density.	Capacity of part in Pyramid cubic in. of distilled water (T. 50° B. 39°)	Name now proposed to be given to each kind or part.
1	.....	2500.	12,500.	71,250.	.....ton
4	4.	625.	3,125.	17,615.	.....quarter
10	2.5...	250.	1,250.	7,125.	.....wey
25	2.5...	100.	500.	2,850.	.....cwt.
250	10.	10.	50.	285.	.....stone
2,500	10.	1.	5.	28.5	.....pound
25,000	10.	0.1	0.5	2.85	.....ounce
250,000	10.	0.01	0.05	0.285	.....dram
2,500,000	10.	0.001	0.005	0.0285	.....ten grain
25,000,000	10.	0.0001	0.0005	0.00285	.....grain

Pyramid and British capacity measures, compared through the temporary medium of English cubic inches, approximately:

Coffer, Pyramid.....	71,463.750.....	4 quarters, English...	70,982.144
Quarter, "	17,865.938.....	1 quarter, "	17,745.536
Sack, "	7,146.375.....	1 sack, "	6,654.576
Bushel, "	2,858.550.....	1 bushel, "	2,218.192
Gallon, "	285.855.....	1 Gallon, "	277.274
Pint, "	28.585.....	1 pint, "	34.659
Oz. in wine glass "	2.858.....	1 ounce, Apoth., "	1.733
Dram or teas'p'n " .....	.286.....	1 dram, "	0.217
Drop, " .....	.003.....	1 drop, "	0.004

The measures correspond now with the Pyramid in quarter, sack, and bushel, for many parts of the world.

Pyramid and British weight measures, compared through the medium of English artificial grains:—

1 grain, Pyramid,	0.7.212.....	1 gr'n Old Sax'n,	.75000
1 drachm, "	72.120.....	{ 1 drachm, av.,	27,34375
1 ounce, "	721.200.....	{ 1 drachm, ap.,	60,00000
1 pound, "	7,212.000.....	{ 1 oz., av.,	437.50000
1 stone, "	72,120.000.....	{ 1 oz., Tr. or ap.,	480.00000
1 cwt., "	721,200.000.....	{ ancient weight,	7,100.00000
1 wey, "	1,808,010.000.....	{ Old Eng. & Sc't'd	7,600.00000
1 ton, "	18,080,100.000.....	{ 1 stone, meat,	56,000.00000
		{ 1 stone, wool,	98,000.00000
		{ 1 cwt., av.,	784.00000
		{ 1 ton, av.,	15,680.00000
		{ 1 ton, ship,	18,160.00000

Of this pound weight, 7,212 grains, forty-seven places in different parts of the earth have the same weight for the pound or *libra*. Its origin must be as ancient as the sign of *libra* or *scales* in the zodiac.

GREAT PYRAMID LENGTH MEASURE.					Earth's semi-axis rot'n
Division or number in the grand length standard.	Inter-medi-ate di-vision.	Length in miles.	Length in Pyramid cubits or arms.	Length in Pyramid inches.	
1,000	1 1,000.	4,000.	10,000,000	250,000,000.	.....league
1,000	4.	4.	10,000	250,000.	.....mile
4,000	10.	1.	2,500	62,500.	.....furlong
40,000	2.5	0.4	250	6,250.	.....acre side
100,000	10.		100	2,500.	.....rod
1,000,000	10.		10	250.	.....cubit or arm
10,000,000	10.		1	25.	.....foot
120,833,333	25.			12	.....inch
250,000,000	10.			1.	.....tenths
2,500,000,000	10.			0.1	.....hundredths
25,000,000,000	10.			0.01	.....thousandths
250,000,000,000	10.			0.001	.....millionths

Pyramid and British linear measure compared through the temporary medium of British linear inches:—

1 inch,	Pyr.	1.001.....	1 inch British,	1,000
1 foot,	"	12.012.....	1 foot, "	12,000
1 cubit or arm,	"	25.025.....	2 ft. rule, "	24,000
1 rod,	"	250.250.....	1 rod, "	198,000
1 acre side	"	2,502.500.....	1 acre side, "	2,504.525
1 mile,	"	62,562.500.....	1 mile "	63,360,000
1 league,	"	250,250.000.....	1 league, "	218,721,000
1 earth's semi axis of rotation,		.....	1 earth's semi axis of rotation,	
		250,250,000.000		250,250,000.000

The cubit is the ell in many parts of the earth; principally called *braccio* or *arm*.

For linear measure of the Pyramid, the Professor gives the following:—

Denominations.	Reference to Earth's Axis of Rotation.
Unit.....	1 inch = 1-500,000,000
12 inches.....	1 foot = 1-41,666,666+
25 inches.....	1 arm = 1-20,000,000
10 arms.....	1 rod = 1-200,000
25 acre sides.....	1 mile = 1-8,000
4 miles.....	1 league = 1-2,000 axis and 1-1000 radius.

Time would fail me if I attempted to record the hundredth part of the discoveries of these earnest workers. I can only hope to direct your attention to this subject, as one most worthy of it.

If the tabernacle and the ark of the covenant were built by Moses after the pattern given by God Himself, and the pattern of the temple as given by David was, as he says, "by the Spirit and as with the hand of God upon me," we may well be assured that a no less inspiration directed the masonry and building of the Great Pyramid. The correlation between the measures of the Pyramid as a whole, of its passages, galleries, ante-chamber, Queen's chamber, and the Coffin, and these with the Ark of the Covenant, with the Tabernacle, and Temple of Solomon, show a sublimity of design and execution beyond the knowledge of the greatest minds of our day, or of any with whose history we are acquainted.

If we were to seek this day for a place upon the earth in which to make experiments where the standards might be expected to remain most perfect, where could we find one more sure and suitable than the Great Pyramid, where all has remained the same for over four thousand years?

And if we desired uniform temperature, could we construct a place more suitable than the King's Chamber, where the temperature remains always at 68 Fah.?

We talk of establishing an International Building and Bureau at Paris; where can we find such a building in all the world for a standard as the Great Pyramid to-day is? Would not its interior be the very place from which to send forth standards?

I have not had time to touch upon the question of density of the earth as given by the Pyramid, nor of many

others there given, of deep interest to us as Engineers. But I am obliged to leave this with a fuller discussion for a time when I may have more leisure, and when my mind shall have more fully grasped the great truths developed and developing each day in this matter.

I will close, therefore, with a summation of the whole matter, well done in a work of Dr. Seiss, which I have obtained since this paper has been written, viz :—

- “1. That the French Metric System is unscientific.
2. It is founded on a curved line instead of a straight line.
3. It is based on the particular meridian of Paris, of the infinite number.
4. It is inaccurate and untrue, as now admitted.
5. It is inharmonious with nature.
6. It is bi-lingual.
7. Its terms are cumbersome and long.
8. Its unit of length is not a natural stride, and has no reference to personal measures.
9. It is offensive in its religious relations.
10. It is not in consonance with, and is farthest removed from, scriptural and sacred systems of weights and measures, of all known systems.
11. We have a better system now, so closely allied to that of the Great Pyramid, to which it would be perfectly practicable and easy to refer all weights and measures.
15. The adoption of the French system by us would be practically and profoundly oppressive.”

There is a *wise* class of scientists in this day and generation who look with profound scorn at the allusion to anything scriptural or religious in the discussion of science—they have wrapped themselves in the prejudices engendered

by the persecutions of Science by *the* Church in a past age, and because of the tendency of some *ecclesiastics* to divorce science and religion, and forgetting that the Reformation brought disenthralment to the mind of man, and left Science to cope with and overthrow the Scriptures, if it could, they manifest an unholy horror whenever inspiration is brought into the discussion of Science.

We should not have so learned the past.

Every attempt of Science to overthrow Inspiration has so far failed, or is in the progress of failure, and *will forever fail*.

The true and only way for us to work is by seeking the inspiration of God in our hearts and minds, in our pursuit of Science, then will Science and Religion walk hand in hand.

Let us take God in our counsel, and we shall then not fail to have a revelation of the truth in our investigations and conclusions.

The subject is too extensive, too deeply important, indeed vital, to our nationality, to treat in a brief paper; and if the citizen is induced by these few pages to study and understand for himself what it is proposed to do with his birth-right, it will serve its purpose. Let no man judge for you in that matter. Study for yourself.

Believing firmly that the “*Anglo-Saxon world*” will never, and ought never, to adopt the French Metric system, I earnestly commend you to look to the Great Pyramid, as our Great Seal teaches us, for our weights and measures; and let us not be turned aside from the paths of rectitude or right lines by the specious devices of blind or wicked guides.



OBSERVE VIEW OF THE UNITED STATES SEAL.



REVERSE VIEW OF THE UNITED STATES SEAL.

Problems of the Great Pyramid and the United States Seal.

Let H=Height of Pyramid, 5813.

" B=One side of Base of Pyr., 9131'030329, or 9131'055.

" D=Diagonal of base, 12913'5.

" $\pi=3\cdot14159265+$.

" d=Solid Diagonal of King's Chamber, 515'1645.

" W=Width of Grand Gallery above Ramp Stone, 82'20

" M=Granite of Antechamber floor, 103'0329.

" R=Radius of Circle of Seal=H=5813.

" Y=Inches=Number of days in a year, 365'2422.

" C=Sacred cubit=25 Pyramid inches.

" A=Area of section of Pyramid, 265294.

" L=Length of Antechamber floor, 116'26.

" P=Horizontal Perimeter of coffer at base, 257'5.

From which we have the following:

- | | |
|---|--|
| (1) $2D=\text{No. of years of precessional cycle.}$ | (7) $y \div \pi = L.$ |
| (2) $d = B \div \sqrt{\pi}.$ | (8) $D \div \pi = 50W.$ |
| (3) $4B = 2\pi H = 100y.$ | (9) $A = 100d^2$ |
| (4) $B \div 25 = y.$ | (10) $M = \sqrt{L^2 \pi} \div \sqrt{4}.$ |
| (5) $2\pi H \div 100 = y.$ | (11) $M = d \div 5.$ |
| (6) $B \div 25\pi = L.$ | (12) $d \div 2 = p.$ |
| | (13) $\pi \div 2B = 1 \div \pi.$ |

The above are a few of the problems proven by the workmen, and the seal having been constructed upon these proportions, exhibits these results. *There is yet more light to break forth from this "Pillar of Witness."*

$$(B \div 5) - (M \div 2) = x = 1774'6896158.$$



APPENDIX.

THE GREAT SEAL OF THE UNITED STATES.

The introduction of the Great Seal of the United States in connection with this subject of measures may seem to many persons not relevant, but I have been led to conclude that it has a very important bearing upon it, and hence I deem a description of the reverse seal important, and the introduction of both not inappropriate.

The Reverse of the Seal has never been used, and indeed it has never been cut at all. This I have direct from the State Department.

The following is the report upon the adoption of both the obverse and reverse of the Great Seal, and is taken from Capt. (now Gen'l.) Schuyler Hamilton's History of the American Flag.

"On July 4th, 1776, Benjamin Franklin, John Adams, and Thomas Jefferson were elected a committee to prepare a device for a Great Seal for the United States of America.

Report made August 10, 1776. The device was not adopted.

The Great Seal on one side was to have emblems as follows:

A six quarten shield.

For England, a rose, enamelled gules and argent.

For Scotland, argent, a thistle proper.

For Ireland, vert, a harp.

For France, azure, Fleur de lis, *or*:

For Germany, *or*, the imperial eagle, *sable*.

For Holland, *or*, the Belgic Lion, gules, pointing out the countries from which the States have been peopled.

The shield with a border, gules entwined, of thirteen scutcheons, *argent*, linked together by a chain—*or*, each charged with initial letters of the Thirteen States.

Supporters, dexter, the Goddess of Liberty, in a corslet of armor, alluding to the present times; holding in right hand the spear and cap, and with her left supporting the shield of the States; sinister, the Goddess of justice bearing a sword in her right hand, and in her left a balance.

Crest—the eye of Providence in a radiant triangle, whose glory extends over the shield and beyond the figures. Motto: *E Pluribus Unum*.

Legend around the whole achievement—Seal of the United States of America, MDCCLXXVI.

On the other side of the Great Seal should be the following device:

Pharoah sitting in an open chariot, a crown on his head and a sword in his hand, passing through the divided waters of the Red Sea in pursuit of the Israelites.

Rays from a pillar of fire in the clouds, expressive of the Divine Presence and Command, beaming on Moses,

who stands on the shore, and extending his hand over the sea, causes it to overthrow Pharoah. Motto: *Rebellion to tyrants is obedience to God*.

March 25th, 1779, another committee was formed—Lovell, Scott and Houston. Report made May 10th, 1779.

William Barton, on June 13th, 1782, presented a device. the *principle* of which now composes the obverse of the Great Seal of the United States.

And on the 13th of June, 1782, Messrs. Middleton. Boudinot and Rutledge, reported the following, which was adopted on the 20th of June, 1782:

That the device for an armorial achievement and reverse of a Great Seal for the United States in Congress assembled is as follows:

Arms. Paleways of thirteen pieces, argent, and gules, a chief azure. The escutcheon on the breast of the American bald Eagle, displayed proper, holding in his dexter talon, an olive branch, and in his sinister a bundle of thirteen arrows, all proper, and in his beak a scroll, inscribed with this motto: *E Pluribus Unum*.

For the Crest. Over the head of the Eagle, which appears above the escutcheon, a glory, *or* breaking through a cloud proper, and surrounding thirteen stars, forming a constellation, argent on an azure field.

Reverse. A Pyramid unfinished. In the zenith, an eye in a triangle, surrounded with a glory proper.

Over the eye these words: *Annu't Cœptis*; on the base of the Pyramid, the numerical letters MDCCLXXVI, and underneath, the following motto: *Novus ordo Seclorum*.

Remarks and Explanations. The escutcheon is composed of chief and pale, the two most honorable ordinaries. The pieces paly represent the several States all join-

ed in one solid compact, entire, supporting a chief, which unites the whole, and represents *Congress*.

The motto, alluding to this Union—The pales in the arms are kept closely united by the chief, and the chief depends on that union, and the strength resulting from it for its support, to denote the confederacy of the United States of America, and the preservation of their Union through Congress.

The colors of the pales are those used in the flag of the United States of America: white signifies purity and innocence; red, hardness and valor; and blue, perseverance and justice. The olive branch and arrows denote the power of peace and war, which is exclusively vested in Congress.

The constellation denotes a new State taking its place and rank among the sovereign powers. The escutcheon is borne on the breast of the American Eagle, without any other supporters, to denote that the United States of America ought to rely on their own virtue.

Reverse. The Pyramid signifies strength and duration. The eye over it, and the motto, allude to the many, and signal interpositions of Providence, in favor of the American cause. The date underneath is that of the Declaration of Independence; and the words under it signify the beginning of the new American era, which commences from that date."

The reverse is that which we have particularly to deal with here.

My mind was directed to this curious seal several years ago in connection with another subject, and I then concluded that it concealed some important truths, and since then I have noticed that other minds are likewise directed towards it, and they too, wonder why such a symbol as an

unfinished Pyramid should have been selected, and why a triangle stand alone with the all-seeing eye therein, with the emanations therefrom.

There are mysteries in the birth of our nation, and men wrought wiser than they knew, and I feel that those men who framed our seal, certainly wrought wiser than they knew, and the matter seems the more sure, if we may believe that they only mean what is described in the report already given, but there is good reason for believing that those forefathers of ours were deeper students into the mysteries of the past, and the predictions of the future, than we have given them credit for.

It would seem that they had the Great Pyramid of Ghizeh in their minds—an unfinished Pyramid, and they seem to have had the idea too that it must some day be finished, for the triangle above is a suggestion of it.

When I determined to have a seal cut for the pamphlet, after having sought in vain throughout the country for one, I concluded that the proper way to do was to take the precise dimensions of the Great Pyramid as a symmetrical and symbolic structure for the reverse of the seal, and then in the construction of it I raised the cap stone, including the casing stones, directly above, forming that "*Corner Stone*," a symbol of that "stone which the builders rejected" so aptly presented by Prof. Smyth—so that if the corner stone be let down upon the top of the unfinished part it would form a perfect structure, complete and symmetrical in all of its parts.

The circle surrounding the Seal represents the expression $2\pi \times \text{Radius}$, and equals 100 times the number of days and fractions of a day in a year; thus 5813 , the height of the Pyramid, multiplied by $2 \times 3,141592 = 36524.22$, and

one-fourth of the circumference of this circle is equal to the base side of the Great Pyramid.

Now in analyzing the meaning of the words *Annuit Cœptis*, we see that there may be something beyond the letter. The rendering in English is "He hath favored our undertakings." To what does this *He* refer? Evidently to the Godhead represented by the Triangle.

This symbol is as ancient as any record of man, and is Kabalastic. It is found in many parts of the world, and is especially noted as a Hindoo symbol, but it may be, and doubtless is, a much surer sign of a pure worship from whence all true worship came, than the symbol of heathendom.

Placed as it is above the unfinished Pyramid, it has a particular meaning known to the designer, and of a significance probably not yet thoroughly explained.

It is true that the all-seeing eye refers to the over ruling Providence which established us as a nation, but I cannot but believe that in the selection of the number of letters in "*Annuit Cœptis*" 12 and 13, that there is a special and particular meaning, referring to the 12 tribes, the 12 Colonies, the 13 States, and meaning the Church and the Sons of God, and since this nation was and is the child of persecution, that which the builders cast out and rejected, the corner stone above represents it as now becoming the chief corner stone.

Again the words *Novus ordo seclorum* "*A new order of generations*," marked below the date of 1776, which is inscribed upon the Pyramid near the base, contains 17 letters, and the spelling of the word *seclorum* shows that the number 17 was intended. Now St. Augustine gives the number 17 as meaning God's people.

Dr. Mahan thus states it: "Seventeen, says St. Augustine, is the number of God's people, being the 10 of the commandment with the 7 of the Spirit, and signifying those who through the spirit are enabled to fulfil the commandment. The meaning is warranted by innumerable examples, etc."

Now the "*Novus ordo seclorum*" is from the 4th Eclogue of Virgil, borrowed from the Sybiline records.

"The last age of Cumæan Song now comes.

A mighty order of ages is born anew.

Both the *prophetic Virgin* and Saturnian kingdoms now return.

Now a new progeny is let down from the lofty heavens.

Favor, chaste Lucina, the boy soon to be born.

In whom the iron age shall cease.

And the golden one arise in the whole world."

It is now time to have the Reverse of the Great Seal cut and used.

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